



**CONTRACT DOCUMENTS
AND
TECHNICAL SPECIFICATIONS
FOR
ACCESS ROAD EXTENSION
PHASE 1**

PREPARED FOR:



J – 27706.0003

NOVEMBER 2024

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DOCUMENT 00021**INVITATION TO BID****Legal Notice**

1. Sealed bids for the construction of the Saluda County Access Road Extension Phase 1 will be received by Thomas & Hutton in the Saluda County Administration Conference Room located at 400 West Highland Street, Saluda, South Carolina 29138 until **3:00 PM local time on January 29, 2025**, at which time they will be publicly opened.
2. The project consists of the following generally described work:

The extension of approximately 1,315 LF of the existing Saluda Commerce Park entrance road and associated clearing, grading and drainage. This project will also include the installation of approximately 2,370 LF of 8" water line, 1,775 LF of 8" sewer line, and associated utility appurtenances.
3. Plans and Specifications can be obtained from Thomas & Hutton Engineering Co., 1501 Main Street, Suite 400, Columbia, SC 29201. Please contact Allison Busch, P.E. at busch.a@tandh.com. Electronic copies will be provided at no cost; however, hard copies can be provided for a non-refundable payment of \$100.
4. Bids shall be accompanied by a bid bond or certified cashier's check in an amount not less than 5% of the base bid. All bonds shall be by a surety company licensed in **South Carolina** with an "A" minimum rating of performance and a financial strength of at least five times the contract price as listed in the most current publication of "Best's Key Rating Guide Property Liability." Performance and Payment Bonds, each in an amount equal to 100% of the contract price shall be required of the successful bidder if contract is awarded. Each Bond shall be accompanied by a "Power of Attorney" authorizing the attorney-in-fact to bind the surety and certified to include the date of the bond.
5. Owner reserves the right to reject any or all Bids, including without limitation, the rights to reject any or all nonconforming, nonresponsive, unbalanced or conditional Bids and to reject the Bid of any Bidder if Owner believes it would not be in the best interest of the Project to make an award to Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by the Owner.
6. There will not be a pre-bid meeting for this project. Bidders shall submit all questions in writing to Allison Busch at busch.a@tandh.com by January 22, 2025.

SALUDA COUNTY

END OF INVITATION TO BID

DOCUMENT 00110

INSTRUCTIONS TO BIDDERS

INTENTION: It is intended the Instructions to Bidders, General Conditions, Supplementary Conditions, Technical Specifications and Construction Drawings shall cover the complete work to which they relate.

ARTICLE 1 **DEFINED TERMS:** In addition to the terms defined in the General Conditions, (EJCDC C-700) (2007), additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof.

- 1.1. **Bidder** - One who submits a Bid directly to Owner as distinct from a sub-bidder, who submits a bid to a Bidder.
- 1.2. **Successful Bidder** - The lowest, responsible, and responsive Bidder to whom Owner (based on Owner's evaluation as hereinafter provided) makes an award.
- 1.3. **Bid** - A complete and properly signed offer to execute work for the prices stipulated in Bid Form and submitted in accordance with the Bidding Documents.
- 1.4. **Addenda** - Graphic or written documents issued by Engineer prior to the opening of Bids issued to clarify, revise, add to, or delete information in the original bidding documents or in previous addenda.

ARTICLE 2 **BID FORM:** All Bids must be made upon the Bid Forms hereto annexed and shall state the amount bid for each item shown, and all bids must be for materials and work called for in the specifications. **Deposits for plans and specifications are not refundable.**

- 2.1 The Bid Form is included with the Bidding Documents; additional copies may be obtained from the Engineer.
- 2.2 All blanks on the Bid Form must be completed by printing in black ink or by typewriter.
- 2.3 Bids by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature.
- 2.4 All names must be typed or printed in black ink below the signature.
- 2.5 The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which must be filled in on the Bid Form.)

- 2.6 The address and telephone number for communications regarding the Bid must be shown.

ARTICLE 3 QUALIFICATIONS OF BIDDERS:

- 3.1 To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit within five days after Bid opening upon Owner's request detailed written evidence such as financial data, previous experience, present commitments, and other such data as may be necessary to assist Owner in determining Contractor's qualifications.
- 3.2 Each Bid must contain evidence of Contractor's authority to conduct business in the state where the Work is to be performed. State Contractor license number, if applicable, must also be shown on the Bid Form.

ARTICLE 4 COPIES OF BIDDING DOCUMENTS:

- 4.1 Complete sets of Bidding Documents must be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 4.2 Owner and Engineer in making copies of Bidding Documents available for a non-refundable deposit do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

ARTICLE 5 EXAMINATION OF BIDDING DOCUMENTS, OTHER DATA, AND SITE:

- 5.1 It is the responsibility of each Bidder before submitting a bid:
- 5.1.1 To examine and study thoroughly the Bidding Documents and other related data identified in the Bidding Documents;
- 5.1.2 To visit the work site to ascertain by inspection pertinent local conditions such as location, character and accessibility of the site including existing surface and subsurface conditions in the work area; availability of facilities, location and character of existing work within or adjacent thereto, labor conditions, etc.
- 5.1.3 To become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, or performance of the Work;
- 5.1.4 To obtain and carefully study (or assume responsibility for doing so) all addition or supplementary examination investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance or the Work or which relate any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including any specific means, methods, techniques, sequences, and procedures of construction expressly

- required of the bidding documents, and safety precautions and programs incident thereto;
- 5.1.5 To study and carefully correlate Bidder's knowledge and observations with the Bidding Documents and such other related data; and
 - 5.1.6 To promptly notify Engineer of all conflicts, errors, ambiguities or discrepancies which Bidder has discovered in or between the Bidding Documents and such other related documents;
 - 5.1.7 to agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;
 - 5.1.8 To become aware of the general nature of the work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents;
 - 5.1.9 To determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- 5.2 The Owner shall make available to all prospective bidders, previous to receipt of bids, information that it may have as to sub-soil conditions and surface topography at the work site. Such information shall be given as the best factual information available without being considered as a representation of the Owner.
- 5.3 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 5, that without exception, the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by ENGINEER are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 7 INTERPRETATIONS AND ADDENDA:

- 7.1 All questions about the meaning or intent of the Bidding Documents are to be directed to Engineer. The person submitting the request shall do so in writing and be responsible for its prompt delivery. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Bidding Documents.

Questions received less than ten days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

- 7.2 Addenda may also be issued to modify the Bidding Documents as deemed advisable by Owner or Engineer.

ARTICLE 8 BID SECURITY:

- 8.1 Each Bid must be accompanied by Bid security made payable to Owner in an amount of five percent of Bidder's maximum Bid price and in the form of a certified or bank check or a Bid Bond (on form attached, if a form is prescribed) issued by a surety company licensed in **South Carolina** with an "A" minimum rating of performance and a financial strength of at least five times the contract price as listed in the most current publication of "Best's Key Rating Guide Property Liability
- 8.1 The Bid security of Successful Bidder will be retained until such Bidder has executed the Agreement, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Agreement and furnish the required contract security within fifteen days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of the seventh day after the Effective Date of the Agreement or the sixty-first day after the Bid opening, whereupon Bid security furnished by such bidders will be returned. Bid security with Bids that are not competitive will be returned within seven days after the Bid opening.

ARTICLE 9 CONTRACT COMPLETION TIME: The number of days within which, or by which the Work is to be (a) Substantially Completed and (b) also completed and ready for final payment are set forth in the Agreement. Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 10 SUBSTITUTE AND "OR-EQUAL" ITEMS:

- 10.1 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or "or-equal" items. Whenever it is specified or described in the Bidding Documents that a substitute or "or-equal" item of material or equipment may be furnished or used by CONTRACTOR if acceptable to ENGINEER, application for such acceptance will not be considered by ENGINEER until after the Effective Date of the Agreement. The procedure for submission of any such application by CONTRACTOR and consideration by ENGINEER is set forth in the General Conditions and may be supplemented in the General Requirements

ARTICLE 11 SUBCONTRACTORS, SUPPLIERS, AND OTHERS:

- 11.1 Each bid must be accompanied by a list of Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity. If OWNER or ENGINEER, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, OWNER or ENGINEER may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, in which case apparent Successful Bidder shall submit an acceptable substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and OWNER may consider such price adjustment in evaluating Bids and making the contract award
- 11.2 If apparent Successful Bidder declines to make any such substitution, OWNER may award the Contact to the next lowest Bidder proposing to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which OWNER or ENGINEER makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to OWNER and ENGINEER subject to revocation of such acceptance after the Effective Date of the Agreement as provided in paragraph 6.06 of the General Conditions.
- 11.3 CONTRACTOR shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom CONTRACTOR has reasonable objection.

ARTICLE 12 SUBMITTAL OF BIDS: Bids shall be submitted at the time and place indicated in the Invitation to Bid and shall be enclosed in a sealed opaque envelope, marked with the project title, and name and address of Bidder, and accompanied by the Bid security and other required documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it. Contractor license number(s) shall be written on the face of the bid envelope.

Each Bidder is responsible for seeing their Bid is received by the Owner not later than the advertised time set for the opening of Bids.

ARTICLE 13 MODIFICATION AND WITHDRAWAL OF BIDS:

- 13.1 Bids may be modified or withdrawn by an appropriate document duly executed (in the manner a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of bids.
- 13.2 If, within twenty-four hours after Bids are opened, any Bidder files a duly signed, written notice with Owner and promptly thereafter demonstrates

to the reasonable satisfaction of Owner there was a material and substantial mistake in the preparation of its Bid, Bidder may withdraw its Bid and the Bid security will be returned. Thereafter, Bidder will be disqualified from further bidding on the Work to be provided.

ARTICLE 14 OPENING OF BIDS: Bids will be opened and (unless obviously non-responsive) read aloud publicly at the place where Bids are to be submitted. An abstract of the amount of the base Bids and major alternates (if any) will be made available to Bidders after the opening of Bids.

ARTICLE 15 ACCEPTANCE OF BIDS: Bids may not be withdrawn (except as noted in Paragraph 13) after the time set for the opening of Bids. Bids will remain subject to acceptance for 60-days after the day of the Bid opening, but the Owner may, in its sole discretion, release any Bid and return the Bid security prior to expiration of the acceptance period.

ARTICLE 16 AWARD OF CONTRACT:

16.1 Owner reserves the right to reject any or all Bids, including without limitation, the rights to reject any or all nonconforming, nonresponsive, unbalanced or conditional Bids and to reject the Bid of any Bidder if Owner believes it would not be in the best interest of the Project to make an award to a Bidder, whether because the Bid is not responsive, or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by the Owner.

16.2 Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

16.3 In evaluating Bids, Owner will consider the qualification of Bidders, whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

The Owner will also consider whether the Bidder involved:

- a) Maintains a permanent place of business;
- b) Has adequate plant and equipment to do the work properly and expeditiously;
- c) Has suitable financial status to meet obligations incidental to the work;
- d) Has appropriate technical experience.

16.4. Owner may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted as provided in the

Supplementary Conditions. Owner also may consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.

- 16.5. Owner may conduct such investigations as Owner deems necessary to assist in the evaluation of any bid and to establish the responsibility, qualifications and financial ability of Bidders, proposed Subcontractors, Suppliers and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.
- 16.6. If the contract is to be awarded, it will be awarded to the Bidder whose evaluation by Owner indicates the award will be in the best interest of the Project.
- 16.7. If the contract is to be awarded, Owner will give Successful Bidder a Notice of Award within 60-days after the day of the Bid opening.

ARTICLE 17 MODIFICATIONS OF QUANTITIES: If the lowest bona fide Bid exceeds the money available for the Work, the Owner reserves the right to delete enough of the Work to bring the cost within the available funds. The Owner also reserves the right to delete whichever items or portions of items considered to be in the best interest of the Owner.

ARTICLE 18 CONTRACT SECURITY: The General Conditions and Supplementary Conditions set forth Owner's requirements as to performance and payment bonds. When the Successful Bidder delivers the executed Agreement to the Owner, it must be accompanied by the required performance and payment bonds.

ARTICLE 19 SIGNING THE AGREEMENT: When the Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within 15-days thereafter, Contractor shall sign and deliver the required counterparts of the Agreement and attached documents to Owner with the required Bonds. Within 10-days thereafter, Owner shall deliver one fully signed counterpart to Contractor.

ARTICLE 20 LAWS AND REGULATIONS: The Contractor shall comply with local, District, County, State, and Federal laws applicable to the work.

The Contractor shall comply with the Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 as amended through January 1, 2004 (PL 91-596) and under Section 107 of the Contract Work and Safety Standards Act (PL) 91-54). The regulations are administered by the Department of Labor and the Contractor shall allow access to the project to personnel from this Department.

ARTICLE 21 CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE: Contractor shall not commence work under this contract until obtaining all the insurance required by the Supplementary Conditions.

ARTICLE 22 **TERMINATION OF CONTRACT:** If the Owner is made to stop construction of the work because of an order from a Court or State Department, the contract shall be terminated. Payment will be made for work completed and a proration of the work underway, materials stored, and for the overhead and profit of the completed work and work underway. Payment will not be made for anticipated profit and overhead on work not completed or underway.

DOCUMENT 00313**BID FORM****PROJECT IDENTIFICATION:** Saluda Access Road Extension Phase 1**CONTRACT IDENTIFICATION AND NUMBER:** J-27706.0003**THIS BID IS SUBMITTED TO:** Saluda County

1. The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an agreement with OWNER in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Bid Price and within the Bid Times indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.
2. BIDDER accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the day of Bid opening, or for such longer period of time BIDDER may agree to in writing upon request of OWNER.
3. In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:
 - a. BIDDER has examined and carefully studied the Plans and Specifications for the work and contractual documents relative thereto, and has read all Technical Provisions, Supplementary Conditions, and General Conditions, furnished prior to the opening of Bids and can fulfill the requirements of the work to be performed.
 - b. BIDDER further acknowledges hereby receipt of the following Addenda:

ADDENDUM NO.	DATE

- c. BIDDER has visited the site and become familiar with and is satisfied as to the general, local and site conditions possibly affecting cost, progress, performance and furnishing of the Work;
- d. BIDDER is familiar with and is satisfied as to all federal, state, and local Laws and Regulations possibly affecting cost, progress, performance and furnishing of the Work.
- e. BIDDER has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or

relating to existing surface or subsurface structure at or contiguous to the site (except underground Facilities) have been identified in the Supplementary Conditions. BIDDER acknowledges such reports and drawings are not Contract Documents and may not be complete for BIDDER's purposes. BIDDER acknowledges OWNER and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Bidding Documents with respect to Underground Facilities at or contiguous to the site. BIDDER has obtained and carefully studied (or assumes responsibility for having done so) all such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost progress, performance or furnishing of the work or which relate to any aspect of the means, methods, techniques, sequences and procedures of construction to be employed by BIDDER and safety precautions and programs incident thereto. BIDDER does not consider any additional examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance and furnishing of the Work in accordance with the times, price and other terms and conditions of the Bidding Documents.

- f. BIDDER is aware of the general nature of Work to be performed by Owner and others at the site relating to Work for which this Bid is submitted as indicated in the Bidding Documents.
 - g. BIDDER has correlated the information known to BIDDER, information and observations obtained from visits to the site, reports and drawings identified in the Bidding Documents and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.
 - h. BIDDER has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies BIDDER has discovered in the Bidding Documents and the written resolution thereof by ENGINEER is acceptable to BIDDER. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work for which this Bid is submitted.
 - i. This bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.
4. BIDDER will complete the Work in accordance with the Contract Documents for the following price(s):

BID PROPOSAL

Item	Description	Quantity	Units	Unit Price	Total
1	AS-BUILT PLANS	1	LS		
2	MOBILIZATION	1	LS		
3	BONDS AND INSURANCE	1	LS		
4	CONSTRUCTION STAKES, LINES & GRADES	1	EA		
5	TRAFFIC CONTROL	1	LS		
6	CLEARING & GRUBBING	1	LS		
7	UNCLASSIFIED EXCAVATION	4192	CY		
8	BORROW EXCAVATION	6814	CY		
9	FINE GRADING	5772	SY		
10	HOT MIX ASPHALT BASE COURSE - TYPE A (375 PSY)	905	TON		
11	LIQUID ASPHALT BINDER PG64-22	116	TON		
12	MILLING EXISTING ASPHALT PAVEMENT (VARIABLE)	20	SY		
13	HOT MIX ASPHALT INTERMEDIATE COURSE TYPE B (200 PSY)	515	TON		
14	HOT MIX ASPHALT SURFACE COURSE TYPE B (200 PSY)	515	TON		
15	8" AGGREGATE BASE COURSE	5285	SY		
16	4" WHITE BROKEN LINES (GAPS EXCL.) THERMOPLASTIC-90 MIL.	220	LF		
17	4" WHITE SOLID LINES (PVT. EDGE LINES) THERMO. - 90MIL	2630	LF		
18	24" WHITE SOLID LINES (STOP/DIAG LINES) - THERMO.-125 MIL	70	LF		
19	WHITE SINGLE ARROWS (LT, STRGHT, RT) THERMO.-125 MIL.	2	EA		
20	4" YELLOW SOLID LINES (PVT.EDGE LINES) THERMO.- 90MIL	4110	LF		
21	PERMANENT YELLOW PAVEMENT MARKERS BI-DIR.- 4"X4"	411	EA		
22	SIGNAGE	1	EA		
23	18" RC PIPE CUL.-CLASS III	187	LF		
24	24" RC PIPE CUL.- CLASS III	53	LF		
25	18" RC PIPE BEVELED EDGE SECTION	1	EA		
26	24" HEADWALL	2	EA		
27	RIP-RAP (CLASS A)	52	SY		
28	GEOTEXTILE FABRIC FOR EROSION CONTROL UNDER RIPRAP (CLASS 2)	52	SY		

29	PERMANENT COVER	2.87	ACRE		
30	TEMPORARY COVER	2.87	ACRE		
31	TURF REINFORCEMENT MATTING (TRM) TYPE 1	2.10	MSY		
32	SEDIMENT TUBES FOR DITCH CHECKS	300.00	LF		
33	ROCK OUTLETS	3.00	EA		
34	SILT FENCE	4540.00	LF		
35	REPLACE/REPAIR SILT FENCE	908.00	LF		
36	REMOVAL OF SILT RETAINED BY SILT FENCE	1135.00	LF		
37	STABILIZED CONSTRUCTION ENTRANCE	2.00	EA		
38	POROUS BAFFLES	3.00	EA		
39	2" SKIMMER	1.00	EA		
40	FOREBAY BERM	1.00	EA		
41	POND OUTLET CONTROL STRUCTURE	1.00	EA		
42	TIE INTO EXISTING 10" WATER LINE	2.00	EA		
43	8" PVC WATER LINE	2370.00	LF		
44	FIRE HYDRANT ASSEMBLY (FHA)	3.00	EA		
45	8" PVC 22.5° BEND	3.00	EA		
46	8" PVC 45° BEND	3.00	EA		
47	8" GATE VALVE	2.00	EA		
48	JACK AND BORE (INCLUDING 20" STEEL CASING)	30.00	LF		
49	TIE INTO EXISTING SEWER MANHOLE	1.00	EA		
50	8" PVC SEWER LINE	1775.00	LF		
51	4' DIA. PRECAST MANHOLE	8.00	EA		
BASE BID TOTAL:					

TOTAL BID FOR ALL ESTIMATED PRICES _____
(Use words)

_____ (\$ _____)
(Figures)

Unit Prices have been computed in accordance with paragraph 11.03.C of the General Conditions.

BIDDER agrees the Work will be substantially complete within 120 calendar days after the date when the Contract Times commence to run as provided in paragraph 2.03 of the General Conditions and completed and ready for final payment in accordance with paragraph 14.07 of

the General Conditions within 150 calendar days after the date when the Contract Times Commence to run.

BIDDER acknowledges estimated quantities are not guaranteed and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities determined as provided, determined as provided in the Contract Documents.

- 5. BIDDER agrees the Work will be substantially complete and ready for final payment in accordance with paragraph 14.07 of the General Conditions within 120 calendar days after the date when the Contract Times commence to run.
- 6. The following documents are attached to and made a condition of this Bid:
 - a. Required Bid Security in the form of 5 percent of the Bid Total Price.
- 7. The undersigned further agrees in case of failure on his/her part to execute the said contract and the Bond within 15 consecutive calendar days after written notice being given of the award of the contract, the check or bid bond accompanying this bid, and the monies payable thereon shall be paid into the funds of the Owner as liquidated damages for such failure, otherwise, the check or bid bond accompanying this proposal shall be returned to the undersigned.
- 8. Communications concerning this Bid shall be addressed to:

Thomas & Hutton
1501 Main Street, Suite 400
Columbia, SC 29201

Attn: Allison Busch, P.E.
busch.a@tandh.com

- 9. Terms used in this Bid which are defined in the General Conditions or Instructions will have the meanings indicated in the General Conditions of Instructions.

SUBMITTED on _____, 20__.

CONTRACTOR'S NAME

ADDRESS:

BY: _____

State Contractor License No. _____ SC

DOCUMENT 00411

BID BOND

BIDDER (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):

Saluda County _____
400 West Highland Street _____
Saluda, SC 29138 _____

BID

BID DUE DATE: _____

PROJECT (Brief Description Including Location):

Access Road Extension Phase 1 and Utilities at the Saluda County Commerce Park

BOND

BOND NUMBER: _____ DATE: _____
(Not later than Bid Due Date)

PENAL SUM: _____
(5% of Bid Sum)

IN WITNESS WHEREOF, Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER

SURETY

(Seal)
Bidder's Name and Corporate Seal

(Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title

Attest: _____
Signature and Title

- Note:
- (1) Above addresses are to be used for giving required notice.
 - (2) Any singular reference to Bidder, Surety, Owner, or other party shall be considered plural where applicable.

PENAL SUM FORM

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents and Contract Documents.
3. This obligation shall be null and void if:
 - 3.1 Owner accepts Bidder's bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents and Contract Document, or
 - 3.2 All bids are rejected by Owner, or
 - 3.3 Owner fails to issue a notice of award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by bidder and, if applicable, consented to by Surety when required by paragraph 5 hereof.)
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of and any and all defenses based on arising out of any time extension to issue notice of award agreed to in writing by Owner and Bidder, provided that the time for issuing notice of award including extensions shall not in the aggregate exceed 90 days from Bid Due Date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in paragraph 4 above is received by Bidder and Surety, and in no case later than one year after Bid Due Date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notice required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent or representative who executed this Bond on behalf of Surety to execute, seal and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of the Bond conflicts with any applicable provision of any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
11. The term "bid" as used herein includes a bid, offer or proposal as applicable.

DOCUMENT 00506**STANDARD FORM OF AGREEMENT
BETWEEN OWNER AND CONTRACTOR**

THIS AGREEMENT is dated as of the _____ day of _____ in the year 20__ by and between Saluda County (hereinafter called OWNER) and _____ (hereinafter called CONTRACTOR).

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1 WORK

CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

The extension of approximately 1,315 LF of the existing Saluda Commerce Park entrance road and associated clearing, grading and drainage. This project will also include the installation of approximately 2,370 LF of 8" water line, 1,775 LF of 8" sewer line, and associated utility appurtenances.

ARTICLE 2 ENGINEER

The Project has been designed by Thomas & Hutton Engineering Co. who is hereinafter called ENGINEER and who is to act as OWNER's representative, assume all duties and responsibilities and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 3 CONTRACT TIMES

All time limits for Substantial Completion and completion and readiness for final payment as stated in the Contract Documents are of essence to the Contract.

- 3.1 The Work will be substantially complete within 120 calendar days after the date when the Contract Times commence to run as provided in paragraph 2.03 of the General Conditions and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions within 150 calendar days after the date when the Contract Times Commence to run. Included in the contract times are 29 days for rain delay. Time delays due to rain in excess of the above days shall be reported by the Contractor to the Engineer in writing, within 30 days of each event.
- 3.2 *Liquidated Damages.* OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense and difficulties involved in proving the actual loss suffered by OWNER if the Work is not substantially complete on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not

as a penalty) CONTRACTOR shall pay One Hundred Dollars (~~\$500.00~~) for each day that expires after the time specified in paragraph 3.1 for Substantial Completion until the Work is substantially complete. After Substantial completion, if CONTRACTOR shall neglect, refuse or fail to complete the remaining Work within the time specified in paragraph 3.1 for completion and readiness for final payment or any proper extension thereof granted by OWNER, CONTRACTOR, shall pay OWNER One Hundred Dollars (~~\$500.00~~) for each day that expires after the time specified in paragraph 3.1 for completion and readiness for final payment.

ARTICLE 4 CONTRACT PRICE

4.1 UNIT PRICE WORK

OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents an amount in current funds of the amounts determined for all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of item as indicated in the CONTRACTOR'S UNIT PRICE BID (attached hereto as an exhibit), said amount being:

_____ (dollars), \$ _____
 (use words) (figures)

As provided in paragraph 11.03 of the General Conditions estimated quantities are not guaranteed, and determinations of actual quantities and classification are to be made by ENGINEER as provided in paragraph 9.07 of the General Conditions. Unit prices have been computed as provided in paragraph 11.03C of the General Conditions.

ARTICLE 5 PAYMENT PROCEDURES

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

5.1 *Progress Payments; Retainage.* OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment as recommended by ENGINEER, on or about the **25th** day of each month during performance of the Work as provided in paragraphs 5.1.1., 5.1.1.2. and 5.2. below. All such payments will be measured by the schedule of values established in paragraph 2.07 of the General Conditions (and in the case of Unit Price Work based on the number of units completed) as provided in the General Requirements.

5.1.1 *For Cost of Work:* Progress payments on account of the Cost of the Work will be made:

5.1.1.1 Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below, but, in each case, less the aggregate of payments previously made and less such amounts as ENGINEER shall determine, or OWNER may

withhold, in accordance with paragraph 14.02 of the General Conditions.

90% of the Work completed (with the balance being retainage). If Work has been 50% completed as determined by ENGINEER, and if the character and progress of the Work have been satisfactory to OWNER and ENGINEER, OWNER, on recommendation of ENGINEER, may determine as long as the character and progress of the Work remain satisfactory to them, there will be no additional retainage on account of Work completed, in which case the remaining progress payments prior to Substantial Completion will be in an amount equal to 100% of the Work completed.

90% of Cost of the Work (with the balance being retainage) applicable to materials and equipment not incorporated in the Work (but delivered, suitably stored and accompanied by documentation satisfactory to OWNER as provided in paragraph 14.02.A.1 of the General Conditions).

5.1.1.2 Upon Substantial Completion, in an amount sufficient to increase the total payments to CONTRACTOR to **95%** of the Cost of the Work, (with the balance being retainage), less such amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with paragraph 14.02 of the General Conditions.

5.2 *Final Payment.* Upon final completion and acceptance of the Work in accordance with paragraph 14.07 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said paragraph 14.07.

ARTICLE 6 INTEREST

All moneys not paid within thirty (30) days of the due date as provided in Article 14 of the General Conditions, shall bear interest at the rate of 6 percent annually or the minimum required by law at the place of the Project, whichever is greater.

ARTICLE 7 CONTRACTOR'S REPRESENTATIONS

In order to induce OWNER to enter into this Agreement CONTRACTOR makes the following representations:

- 7.1 CONTRACTOR has examined and carefully studied the Contract Documents (including the Addenda indicated in Article 8 hereinafter) and the other related data identified in the Bidding Documents.
- 7.2 CONTRACTOR has visited the site and become familiar with and is satisfied as to the general, local and site conditions possibly affecting cost, progress, performance or furnishing of the Work.
- 7.3 CONTRACTOR is familiar with and is satisfied as to all federal, state, and local Laws and Regulations possibly affecting cost, progress, performance and furnishing of the Work.

- 7.4 CONTRACTOR has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in the General Conditions. CONTRACTOR acknowledges such reports and drawings are not Contract Documents and may not be complete for CONTRACTOR's purposes. CONTRACTOR acknowledges OWNER and ENGINEER do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Contract Documents with respect to Underground Facilities at or contiguous to the site. CONTRACTOR has obtained and carefully studied (or assumes responsibility for having done so) all such additional supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the construction to be employed by CONTRACTOR and safety precautions and programs incident thereto. CONTRACTOR does not consider any additional examinations, investigations, explorations, tests, studies or data are necessary for the performance and furnishing of the Work at the Contract Price, within the Contract Times and in accordance with the other terms and conditions of the Contract Documents.
- 7.5 CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the site relating to the Work as indicated in the Contract Documents.
- 7.6 CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the site, reports and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies and data with the Contract Documents.
- 7.7 CONTRACTOR has given ENGINEER written notice of all conflicts, errors, ambiguities or discrepancies CONTRACTOR has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 8 CONTRACT DOCUMENTS

The Contract Documents which comprise the entire agreement between OWNER and CONTRACTOR concerning the Work consist of the following:

- 8.1 Invitation to Bid
- 8.2 Instructions to Bidders
- 8.3 Bid Form
- 8.4 Bid Bond

- 8.5 Standard Form of Agreement Between Owner and Contractor
- 8.6 Performance Bond
- 8.7 Payment Bond
- 8.8 Notice of Award
- 8.9 Notice to Proceed
- 8.10 General Conditions
- 8.11 Special Conditions
- 8.12 Summary of Work
- 8.13 Soil Investigation Data for Bidders
- 8.14 Measurement and Payment
- 8.15 Bidder's Qualifications
- 8.16 Submittals
- 8.17 Quality Control
- 8.18 Testing Services
- 8.19 Contract Closeout
- 8.20 Bonds
- 8.21 Technical Specifications consisting of sections 02110 to 02902, as listed in the Table of Contents.
- 8.22 Drawings consisting of the following sheets with each sheet bearing the following general title:

Sheet	Description
CS0.1	COVER SHEET
G0.1	GENERAL NOTES AND INDEX
EX1.1	EXISTING CONDITIONS & DEMOLITION PLAN
EC0.1	EROSION CONTROL NOTES
EC0.2	EROSION CONTROL NOTES
EC1.1	EROSION CONTROL PLAN
EC4.0	EROSION CONTROL DETAILS
EC4.1	EROSION CONTROL DETAILS
C0.1	TYPICAL ROADWAY SECTIONS
C3.2	PAVING GRADING AND DRAINAGE PLAN
C3.3	ROAD PROFILE
C4.1	STAKING, STRIPING, AND SIGNAGE PLAN

Sheet	Description
C4.2	TRAFFIC CONTROL PLAN
C4.3	PAVING GRADING AND DRAINAGE DETAIL
C4.4	PAVING GRADING AND DRAINAGE DETAIL
C4.5	STORM WATER PROFILE
C5.1	UTILITY PLAN
C5.2	SEWER PROFILE
C5.3	SEWER PROFILE
C5.4	WATER PROFILES
C5.5	WATER PROFILES
C5.6	WATER DETAILS
C5.7	WATER DETAILS
C5.8	SEWER DETAILS
XC1	ROAD CROSS SECTIONS
XC2	ROAD CROSS SECTIONS

8.23 Addenda numbers ____ to ____, inclusive.

Exhibits to this Agreement:

- a. CONTRACTOR's Bid marked 00313 – Bid Form
- b. Documentation submitted by CONTRACTOR prior to Notice of Award
- c. Any modification, including Change Orders, duly delivered after execution of Agreement

There are no Contract Documents other than those listed above in this Article 8. The Contract Documents may only be amended, modified or supplemented as provided in paragraph 3.04 of the General Conditions.

ARTICLE 9 MISCELLANEOUS

- 9.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.
- 9.2 No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys becoming due and moneys due, may not be assigned without such consent (except to the extent the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.
- 9.3 OWNER and CONTRACTOR each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

9.4 Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon OWNER and CONTRACTOR, who agree the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision coming as close as possible to expressing the intention of the stricken provision.

ARTICLE 10 OTHER PROVISIONS

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in five counterparts. Two counterparts each have been delivered to OWNER and CONTRACTOR and one counterpart to ENGINEER. All portions of the Contract Documents have been signed, initialed or identified by Owner and Contractor or identified by ENGINEER on their behalf.

This Agreement will be effective on _____, 20____ (which is the Effective Date of the Agreement).

OWNER Saluda County

CONTRACTOR _____

BY Sandra Padget

BY _____

SIGNED _____

SIGNED _____

ATTEST _____

ATTEST _____

Address for giving notices

Address for giving notices

400 West Highland Street
Saluda, SC 29138

License No. _____

Agent for service of process: _____

CORPORATE SEAL

CORPORATE SEAL

DOCUMENT 00611**PERFORMANCE BOND**

KNOW ALL MEN BY THESE PRESENTS, _____,
(Name & Address of Contractor)

hereinafter called "Principal" and _____,
(Name & Address of Surety)

_____ of _____

State of South Carolina, hereinafter called the "Surety" are held and firmly bound unto Saluda

County hereinafter called the "Owner" in the penal sum of _____

_____ Dollars (\$ _____)
(Contract Sum)

lawful money of the United States of America, to be paid to OWNER, for the payment whereof well and truly to be made we do bind ourselves, our respective executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above bounden Principal has entered into a certain contract with the Owner dated the _____ day of _____, 20____ for the construction of:

Access Road Extension Phase 1

which said contract is incorporated hereby by reference and made a part hereof and is hereinafter referred to as the Construction Contract.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such, if the Principal shall promptly and faithfully perform and comply with the terms and conditions of said contract; and shall indemnify and save harmless the Owner against and from all costs, expenses, damages, injury or loss to which said Owner may be subjected by reason of any wrongdoing, including patent infringement, misconduct, want of care or skill, default, or failure of performance on the part of said Principal, its agents, subcontractors or employees, in the execution or performance of said Construction Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except to participate in conferences as provided in Subparagraph 3.1.

3. If there is no Owner Default, the Surety's obligations under this Bond shall arise after:
 - 3.1 The Owner has notified the Contractor and the Surety at its address described in Paragraph 10 below, the Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Construction Contract. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default; and
 - 3.2 The Owner has declared a Contractor Default and formally terminated the Contractor's right to complete the contract. Such Contractor Default shall not be declared earlier than twenty days after the Contractor and the Surety have received notice as provided in Subparagraph 3.1; and
 - 3.3 The Owner has agreed to pay the Balance of the Contract Price to the Surety in accordance with the terms of the Construction Contract or to a Contractor selected to perform the Construction Contract in accordance with the terms of the contract with the Owner.
4. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense, take one of the following actions:
 - 4.1 Arrange for the Contractor, with consent of the Owner, to perform and complete the Construction Contract; or
 - 4.2 Undertake to perform and complete the Construction Contract itself, through its agents or through independent Contractors; or
 - 4.3 Obtain bids or negotiated proposals from qualified Contractors acceptable to the Owner in a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and the Contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by the Owner resulting from the Contractor's default; or
 - 4.4 Waive its right to perform and complete, arrange for completion, or obtain a new Contractor and with reasonable promptness under the circumstances:
 - 4.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, tender payment therefor to the Owner; or
 - 4.4.2 Deny liability in whole or in part and notify the Owner citing reasons therefor.

5. If the Surety does not proceed as provided in paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Subparagraph 4.4, and the Owner refuses the payment tendered or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.
6. After the Owner has terminated the Contractor's right to complete the Construction Contract, and if the Surety elects to act under Subparagraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract. To the limit of the amount of this Bond, but subject to commitment by the Owner of the Balance of the Contract Price to mitigation of costs and damages on the Construction Contract, the Surety is obligated without duplication for:
 - 6.1 The responsibilities of the Contractor for correction of defective work and completion of the Construction Contract:
 - 6.2 Additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 4; and
 - 6.3 Liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
7. The Surety shall not be liable to the Owner or others for obligations of the Contractor unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, or successors.
8. The Surety hereby waives notice of any changes, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.
9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
10. Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page.

11. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is this Bond shall be construed as a statutory bond and not as a common law bond.
12. DEFINITIONS:
 - 12.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
 - 12.2 Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto;
 - 12.3 Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Construction Contract.
 - 12.4 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

IN WITNESS WHEREOF, this instrument is executed in six counterparts, each one of which shall be deemed an original, on this the ____ day of _____, 20__.

CONTRACTOR AS PRINCIPAL:

Principal

(Principal) Secretary

By: _____
(Signature & Title)

(SEAL)

Address

Witness as to Principal

Address

SURETY:

Surety (Company)

(Surety) Secretary

By: _____
Attorney-in-Fact

(SEAL)

Witness as to Surety

Address

Notes:

1. Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute bond.
2. Bond must be countersigned by a South Carolina resident agent.
3. Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

DOCUMENT 00621**PAYMENT BOND**

KNOW ALL MEN BY THESE PRESENTS, _____,
(Name & Address of Contractor)

hereinafter called "Principal" and _____,
(Name & Address of Surety)

_____ of _____

State of South Carolina, hereinafter called the "Surety" are held and firmly bound unto Saluda County hereinafter called the "Owner" in the penal sum of _____

_____ Dollars (\$ _____)
(Contract Sum)

lawful money of the United States of America, to be paid to OWNER, for the payment whereof well and truly to be made we do bind ourselves, our respective executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above bounden Principal has entered into a certain contract with the Owner dated the _____ day of _____, 20____ for the construction of:

Access Road Extension Phase 1

which said contract is incorporated hereby by reference and made a part hereof and is hereinafter referred to as the Construction Contract.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such, if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and materials supplied in the prosecution of the work provided for in said Construction Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. With respect to the Owner, this obligation shall be null and void if the Contractor:
 - 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants; and

- 2.2 Defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity whose claim, demand, lien or suit is for payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, provided the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due.
4. The Surety shall have no obligation to Claimants under this Bond until:
 - 4.1 Claimants who are employed by or have a direct contract with the Contractor have given notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating a claim is being made under this Bond and, with substantial accuracy, the amount of claim.
 - 4.2 Claimants who do not have a direct contract with the Contractor:
 - 4.2.1 Have furnished written notice to the Contractor and sent a copy, or notice thereof, to the Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was performed; and
 - 4.2.2 Have either received a rejection in whole or in part from the Contractor, or not received within 30 days of furnishing the above notice, any communication from the Contractor by which the Contractor has indicated the claim will be paid directly or indirectly; and
 - 4.2.3 Not having been paid within 30 days, have sent a written notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the Contractor.
5. Compliance shall be considered sufficient if a notice required by paragraph 4 is given by the Owner to the Contractor or to the Surety.
6. When the Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:
 - 6.1 Send an answer to the Claimant, with a copy to the Owner, within 45 days after receipt of the claim stating the amounts undisputed and basis for challenging any amounts disputed.
 - 6.2 Pay or arrange for payment of any undisputed amounts.

7. The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
8. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any Construction Performance Bond. By the Contractor furnishing and the Owner accepting this Bond, they agree all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and the Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
9. The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor unrelated to the Construction Contract. The Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.
10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.
11. No suit or action shall be commenced by a Claimant under this bond other than in a court of competent jurisdiction in the location in which the work or part of the work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Subparagraph 4.1 or Clause 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to Sureties as a defense in the jurisdiction of the suit shall be applicable.
12. Notice to the Surety, Owner or Contractor shall be mailed or delivered to the address shown on the signature page. Actual receipt of notice by the Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.
13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in the Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is this Bond shall be construed as a statutory bond and not as a common law bond.
14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, the Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. DEFINITIONS:

- 15.1 Claimant: An individual or entity having a direct contract with the Contractor or with a Subcontractor of the Contractor to furnish labor, material, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment," that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.
- 15.2 Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.
- 15.3 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

IN WITNESS WHEREOF, this instrument is executed in six counterparts, each one of which shall be deemed an original, on this the ____ day of _____, 20__.

CONTRACTOR AS PRINCIPAL:

Principal

(Principal) Secretary

By: _____
(Signature & Title)

(SEAL)

Address

Witness as to Principal

Address

SURETY:

Surety (Company)

(Surety) Secretary

By: _____
Attorney-in-Fact

(SEAL)

Witness as to Surety

Address

Notes:

1. Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute bond.
2. Bond must be countersigned by a South Carolina resident agent.
3. Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

SECTION 00631
NOTICE OF AWARD

Dated _____

TO: _____
(Bidder)

ADDRESS: _____

JOB NO.: J-27706.00003

PROJECT: Access Road Extension Phase 1

CONTRACT FOR: The extension of approximately 1,315 LF of the existing Saluda Commerce Park entrance road and associated clearing, grading and drainage. This project will also include the installation of approximately 2,370 LF of 8" water line, 1,775 LF of 8" sewer line, and associated utility appurtenances.

You are notified your Bid dated _____, 20____, for the above Contract has been considered. You are the apparent successful bidder and have been awarded a contract for:

Access Road Extension Phase 1

The Contract Price of your contract is _____

_____ Dollars (\$_____).

_____ copies of each of the proposed Contract Documents (except drawings) accompany this Notice of Award.

_____ sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within 15 days of this Notice of Award, which is by _____, 20_____.

1. You must deliver to the OWNER _____ fully executed counterparts of the Agreement including all the Contract Documents. Each of the Contract Documents must bear your signature on the applicable pages.
2. You must deliver with the executed Agreement the Contract Security (Bonds) as specified in the Instructions to Bidders (Article 8), General Conditions (paragraph 5.01) and Supplementary Conditions.
3. (List other conditions precedent)

Failure to comply with these conditions within the time specified will entitle OWNER to consider your bid in default, to annul this Notice of Award and to declare your Bid Security forfeited.

Within ten days after you comply with the above conditions, OWNER will return to you one fully signed counterpart of the Agreement with the Contract Documents attached.

OWNER Saluda County _____

By: _____

(Title)

ACCEPTANCE OF AWARD

(Contractor)

By: _____
(Authorized Signature)

(Title)

(Date)

SECTION 00641
NOTICE TO PROCEED

Dated _____

TO: _____
(Bidder)

ADDRESS: _____

JOB NO.: J-27706.0003

PROJECT: Access Road Extension Phase 1

CONTRACT
FOR:

The extension of approximately 1,315 LF of the existing Saluda Commerce Park entrance road and associated clearing, grading and drainage. This project will also include the installation of approximately 2,370 LF of 8" water line, 1,775 LF of 8" sewer line, and associated utility appurtenances.

You are notified the Contract Times under the above contract will commence to run on _____, 20___. By such date, you are to start performing your obligations under the Contract Documents. In accordance with Article 3 of the Agreement the dates of Substantial Completion and completion and readiness for final payment are _____, 20__ and _____, 20__, respectively.

Before you may start any Work at the site, paragraph 2.01 of the General Conditions provides you and OWNER must each deliver to the other (with copies to ENGINEER and other identified additional insureds) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Before you may start any Work at the site, you must have submitted the following: Certificate of Insurance, Performance Bond, and Payment Bond.

OWNER Saluda County _____

By: _____

(Title)

ACCEPTANCE OF NOTICE TO PROCEED

(Contractor)

By: _____
(Authorized Signature)

(Title)

(Date)

**Engineers Joint Documents Committee
Design and Construction Related Documents
Instructions and License Agreement**

Instructions

Before you use any EJCDC document:

1. Read the License Agreement. You agree to it and are bound by its terms when you use the EJCDC document.
2. Make sure that you have the correct version for your word processing software.

How to Use:

1. While EJCDC has expended considerable effort to make the software translations exact, it can be that a few document controls (e.g., bold, underline) did not carry over.
2. Similarly, your software may change the font specification if the font is not available in your system. It will choose a font that is close in appearance. In this event, the pagination may not match the control set.
3. If you modify the document, you must follow the instructions in the License Agreement about notification.
4. Also note the instruction in the License Agreement about the EJCDC copyright.

License Agreement

You should carefully read the following terms and conditions before using this document. Commencement of use of this document indicates your acceptance of these terms and conditions. If you do not agree to them, you should promptly return the materials to the vendor, and your money will be refunded.

The Engineers Joint Contract Documents Committee ("EJCDC") provides **EJCDC Design and Construction Related Documents** and licenses their use worldwide. You assume sole responsibility for the selection of specific documents or portions thereof to achieve your intended results, and for the installation, use, and results obtained from **EJCDC Design and Construction Related Documents**.

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2. Use **EJCDC Design and Construction Related Documents** in printed form for bona fide contract documents.
3. Copy **EJCDC Design and Construction Related Documents** into any machine readable or printed form for backup or modification purposes in support of your use of **EJCDC Design and Construction Related Documents**.

You agree that you will:

1. Reproduce and include EJCDC's copyright notice on any printed or machine-readable copy, modification, or portion merged into another document or program. All proprietary rights in **EJCDC Design and Construction Related Documents** are and shall remain the property of EJCDC.
2. Not represent that any of the contract documents you generate from **EJCDC Design and Construction Related Documents** are EJCDC documents unless (i) the document text is used without alteration or (ii) all additions and changes to, and deletions from, the text are clearly shown.

You may not use, copy, modify, or transfer EJCDC Design and Construction Related Documents, or any copy, modification or merged portion, in whole or in part, except as expressly provided for in this license. Reproduction of EJCDC Design and Construction Related Documents in printed or machine-readable format for resale or educational purposes is expressly prohibited.

If you transfer possession of any copy, modification or merged portion of EJCDC Design and Construction Related Documents to another party, your license is automatically terminated.

Term:

The license is effective until terminated. You may terminate it at any time by destroying **EJCDC Design and Construction Related Documents** altogether with all copies, modifications and merged portions in any form. It will also terminate upon conditions set forth elsewhere in this Agreement or if you fail to comply with any term or condition of this Agreement. You agree upon such termination to destroy **EJCDC Design and Construction Related Documents** along with all copies, modifications and merged portions in any form.

Limited Warranty:

EJCDC warrants the CDs and diskettes on which **EJCDC Design and Construction Related Documents** is furnished to be free from defects in materials and workmanship under normal use for a period of ninety (90) days from the date of delivery to you as evidenced by a copy of your receipt.

There is no other warranty of any kind, either expressed or implied, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose. Some states do not allow the exclusion of implied warranties, so the above exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

EJCDC does not warrant that the functions contained in **EJCDC Design and Construction Related Documents** will meet your requirements or that the operation of **EJCDC Design and Construction Related Documents** will be uninterrupted or error free.

Limitations of Remedies:

EJCDC's entire liability and your exclusive remedy shall be:

1. the replacement of any document not meeting EJCDC's "Limited Warranty" which is returned to EJCDC's selling agent with a copy of your receipt, or
2. if EJCDC's selling agent is unable to deliver a replacement CD or diskette which is free of defects in materials and workmanship, you may terminate this Agreement by returning EJCDC Document and your money will be refunded.

In no event will EJCDC be liable to you for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use or inability to use **EJCDC Design and Construction Related Documents** even if EJCDC has been advised of the possibility of such damages, or for any claim by any other party.

Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

General:

You may not sublicense, assign, or transfer this license except as expressly provided in this Agreement. Any attempt otherwise to sublicense, assign, or transfer any of the rights, duties, or obligations hereunder is void.

This Agreement shall be governed by the laws of the State of Virginia. Should you have any questions concerning this Agreement, you may contact EJCDC by writing to:

Arthur Schwartz, Esq.
General Counsel

National Society of Professional Engineers
1420 King Street
Alexandria, VA 22314

Phone: (703) 684-2845
Fax: (703) 836-4875
e-mail: aschwartz@nspe.org

You acknowledge that you have read this agreement, understand it and agree to be bound by its terms and conditions. You further agree that it is the complete and exclusive statement of the agreement between us which supersedes any proposal or prior agreement, oral or written, and any other communications between us relating to the subject matter of this agreement.

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

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NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by



CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
 10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work*—See Paragraph 11.01 for definition.
17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer*—The individual or entity named as such in the Agreement.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 1 of the Specifications.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 Copies of Documents

- A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 Commencement of Contract Times; Notice to Proceed

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on

Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

- A. Standards, Specifications, Codes, Laws, and Regulations
 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;
2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or
3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
 2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 Availability of Lands

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 Subsurface and Physical Conditions

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

- A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:
1. is of such a nature as to establish that any “technical data” on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
 2. is of such a nature as to require a change in the Contract Documents; or
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

- B. *Engineer’s Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner’s obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer’s findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor’s cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and

contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

- c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the

consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.
- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also

meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 - 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 - 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

- a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
 2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
 3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
 4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
 5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
 6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;
 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors,

members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.
- E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's

interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
 - 1. "*Or-Equal*" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
 - 3) it has a proven record of performance and availability of responsive service.
- b. Contractor certifies that, if approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
- c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.
- d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

- c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and
 - 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be

required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner,

Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought

by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and

shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is

required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Submit number of copies specified in the General Requirements.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

- a. Submit number of Samples specified in the Specifications.
- b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

- a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
- b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
- c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
- d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 - 1. observations by Engineer;
 - 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. use or occupancy of the Work or any part thereof by Owner;
 - 5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
 - 6. any inspection, test, or approval by others; or
 - 7. any correction of defective Work by Owner.

6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 Related Work at Site

- A. Owner may perform other work related to the Project at the Site with Owner’s employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner’s employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.
- C. If the proper execution or results of any part of Contractor’s Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor’s Work. Contractor’s failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor’s Work except for latent defects and deficiencies in such other work.

7.02 Coordination

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
 - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 - 3. the extent of such authority and responsibilities will be provided.

- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

- A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or

continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

- A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise

or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
 - 1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
 - 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
 - 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data

shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part;
 2. approve the Claim; or
 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of

said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not

limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:*
 1. Contractor agrees that:
 - a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance:*
 1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to

the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 Change of Contract Price

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
 - 1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 - 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee*: The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or
2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or

neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 Notice of Defects

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 Access to Work

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or
 2. correct such defective Work; or
 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.
- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments:*

- 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an

Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or

involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

- b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
 5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due:

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or
 - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before

final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
 - 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying

documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due:*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

- A. The making and acceptance of final payment will constitute:
 1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
 2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's repeated disregard of the authority of Engineer; or
 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
 2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when

so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 - 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 - 4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days

to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 Methods and Procedures

- A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.
- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
 - 1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or
 - 2. agrees with the other party to submit the Claim to another dispute resolution process; or
 - 3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 Giving Notice

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

DOCUMENT 00710

SPECIAL CONDITIONS

- SC-1 DESCRIPTION OF THE WORK:** The work consists of the extension of approximately 1,315 LF of the existing Saluda Commerce Park entrance road and associated clearing, grading and drainage. This project will also include the installation of approximately 2,370 LF of 8" water line, 1,775 LF of 8" sewer line, and associated utility appurtenances.
- SC-2 COMMENCEMENT AND COMPLETION OF WORK:** The Contractor shall commence work within 10 days after Notice to Proceed is issued. The Contractor shall complete his work in a timely and manner sufficient to support owner's schedule and completion requirements.
- SC-3 DRAWINGS:** The work shall conform to the following drawings, all of which form a part of, and are included in, these specifications and are available in the office of Thomas & Hutton Engineering Co., 1501 Main Street.; Suite 400, Columbia, SC 29201.

Sheet	Description
CS0.1	COVER SHEET
G0.1	GENERAL NOTES AND INDEX
EX1.1	EXISTING CONDITIONS & DEMOLITION PLAN
EC0.1	EROSION CONTROL NOTES
EC0.2	EROSION CONTROL NOTES
EC1.1	EROSION CONTROL PLAN
EC4.0	EROSION CONTROL DETAILS
EC4.1	EROSION CONTROL DETAILS
C0.1	TYPICAL ROADWAY SECTIONS
C3.2	PAVING GRADING AND DRAINAGE PLAN
C3.3	ROAD PROFILE
C4.1	STAKING, STRIPING, AND SIGNAGE PLAN
C4.2	TRAFFIC CONTROL PLAN
C4.3	PAVING GRADING AND DRAINAGE DETAIL
C4.4	PAVING GRADING AND DRAINAGE DETAIL
C4.5	STORM WATER PROFILE
C5.1	UTILITY PLAN
C5.2	SEWER PROFILE
C5.3	SEWER PROFILE
C5.4	WATER PROFILES
C5.5	WATER PROFILES
C5.6	WATER DETAILS
C5.7	WATER DETAILS
C5.8	SEWER DETAILS
XC1	ROAD CROSS SECTIONS
XC2	ROAD CROSS SECTIONS

- SC-4 LAYOUT OF WORK:** Control lines and master benchmarks will be furnished by the Owner. The Contractor will lay out work and will be responsible for all measurements in connection therewith.

SC-5 OBSERVATIONS AND TESTS: Before acceptance of the whole or any part of the work, it shall be subjected to observation and tests to determine it is in accordance with the plans and specifications. The Contractor will be required to maintain all work in a first-class condition for a 30-day operating period after the same has been completed as a whole and the Engineer has notified the Contractor in writing the work has been finished. The Owner shall pay for all testing and shall engage a mutually acceptable laboratory or qualified individual to conduct the tests in accordance with these specifications. No portion of the work will be accepted until tests prove it has been satisfactorily completed. The Contractor shall give the Project Engineer or Project Representative a minimum of 48 hours' notice for all required observations or tests.

SC-6 BONDS: The Performance Bonds in the amount of 100% of the contract amount and Payment Bonds in the amount of 100% of the contract amounts shall be furnished in accordance with Article 5 of the General Conditions.

SC-7 CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE: The Contractor shall not commence work under this contract until obtaining all the insurance required under this paragraph and such insurance has been accepted by the Owner, nor shall the Contractor allow any Subcontractor to commence work on a subcontract until the insurance required of the Subcontractor has been so obtained and accepted.

- a. Compensation and Employer's Liability Insurance: The Contractor shall take out and maintain during the life of the contract the statutory Worker's Compensation and Employer's Liability Insurance for all of its employees to be engaged in work on the project under the contract and, in case and such work is sublet, the Contractor should require the Subcontractor similarly to provide Worker's Compensation and Employer's Liability Insurance for all the latter's employees to be engaged in such work.
- b. Bodily Injury Liability and Property Damage Liability Insurance: The Contractor shall take out and maintain during the life of the contract Bodily Injury Liability and Property Damage Liability Insurance to protect itself and any Subcontractor performing work covered by the contract from claims for damages or personal injury, including accidental death, as well as from claims for property damage, which may arise from operations under the contract, whether such operations be by the Contractor, Subcontractor, or anyone directly or indirectly employed by either of them and the amount of such insurance should be not less than:
 - (1) Bodily Injury Liability Insurance, in an amount not less than \$1,000,000.00 for injuries, including wrongful death to any one person and subject to the same limit for each person in an amount not less than \$2,000,000.00 on account of one accident. Contractual liability should be endorsed on the policy.
 - (2) Property Damage Insurance in an amount not less than \$1,000,000.00 for damages on account of any one accident, and in an amount not less than \$2,000,000.00 for damages on account of all accidents.
- c. Builder's Risk Insurance (Fire and Extended Coverage): The Contractor shall have adequate fire and standard extended coverage, with a company or companies acceptable to the Owner, in force on the project.

The provisions with respect to Builder's Risk Insurance shall in no way relieve the Contractor of its obligation of completing the work covered by the Contract.

- d. Proof of Carriage of Insurance: The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations, effective dates, and date of expiration of policies. Such certificates shall contain substantially the following statement: "The insurance covered by this certification shall not be cancelled or materially altered, except after ten (10) days written notice has been received by the Owner."

- SC-8 HOLD HARMLESS CLAUSE:** The Contractor agrees to hold harmless, indemnify and defend the Owner and its agents, architects, engineers and employees from and against any and all claims, losses, damages, demands, causes of action and any an all related costs and expenses, of every kind and character, growing out of, incidental to, or resulting directly or indirectly from the Contractor's performance of the work described herein, whether such loss, damage, injury, or liability is contributed to by the negligence of the Owner, its agents, architects, engineers, or employees, except the Contractor shall have no liability for damages or the costs incidental thereto caused by the sole negligence of the Owner, its agents, architects, engineers, or employees. The Contractor will require any and all subcontractors to conform with the provisions of this clause prior to commencing any work and agrees to ensure this clause is in conformity with the insurance provisions of the contract.
- SC-9 CONTRACTOR'S STATUS:** It is agreed the Contractor shall occupy the status of an Independent Contractor and the Contractor's employees are not employees of the Owner.
- SC-10 CONTRACTOR'S AFFIDAVIT:** Upon completion of the work and prior to final payment and settlement of all sums due hereunder, Contractor will furnish to Owner a Contractor's Affidavit in the usual form submitted by Contractor under the laws of the State of South Carolina to the effect all bills for labor, materials and services in connection with said contract have been paid in full, acknowledging receipt of the contract price and averring there are no outstanding claims under said contract which could become a lien on the real estate arising out of said contract.
- SC-11 RESIDENT PROJECT ENGINEER:** The Owner reserves the right to furnish a Resident Project Engineer as deemed necessary to insure the Project quality control and conformance to Plans and Specifications, who will act as the Owner's Representative on the Project and will have the authority of the Engineer as set forth in the Contract Documents.
- SC-12 BARRICADES, DANGER AND WARNING SIGNS:** The Contractor shall install and maintain barricades, suitable and sufficient lights, danger signals, signs, and other traffic control devices and shall take all necessary precautions for the protection of the work and safety of the public. Lanes closed to traffic shall be protected by effective barricades, lighted during hours of darkness. Suitable warning signs shall be provided to control, direct traffic, and warn pedestrians. Upon completion all barricades, signs and the like shall be removed.
- SC-13 TOOLS, PLANT AND EQUIPMENT:** If at any time before the commencement or during the progress of the work, tools, plant or equipment appear to the Engineer to be insufficient, inefficient or inappropriate to secure the quality of the work required or the proper rate of progress, the Engineer may order the Contractor to increase their efficiency, to improve their

character, to augment their number, or to substitute new tools, plant, or equipment, as the case may be, and the Contractor must conform to such order; but a failure of the Engineer to demand such increase of efficiency, number, or improvement shall not relieve the Contractor of its obligation to secure the quality of work and the rate of progress necessary to complete the work within the time required by the contract to the satisfaction of the Owner.

SC-14 ACCIDENTS: The Contractor shall provide, at the site, such equipment and medical facilities as are necessary to supply first-aid service to anyone who may be injured in connection with the work. The Contractor must report in writing to the Engineer all accidents whatsoever arising out of, or in connection with, the performance of the work, whether on or adjacent to the site, which causes death, personal injury or property damages, giving full details and statement of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the Contractor and any subcontractor on account of any accident, the Contractor shall promptly report the facts to the Engineer, giving full details in writing of the claim. The Contractor shall advise its superintendent and foreman, who are on the site of the work, the name of the hospital and phone number and the name and phone number of the doctor to use in case of an accident.

SC-15 SANITARY PROVISIONS: The Contractor shall provide temporary sanitary facilities for the use of the workmen during the progress of the work. The sanitary facilities shall conform to the requirements of the County health Engineer. All facilities shall be removed at the completion of the contract.

SC-16 MODIFICATION OF QUANTITIES: The itemized quantities shall be considered by the Contractor as the quantities required to complete the work for the purpose of bidding. Should actual quantities required in the construction of the work be greater or less than the quantities shown on the items, an amount equal to the difference in quantities at the unit prices for the item will be added to or deducted from the contract price.

When itemized quantities are not given in the Proposal, the work shown on the plans or specified shall be considered by the Contractor to be included in the contract for the lump sum prices bid.

SC-17 RESPONSIBILITY REGARDING EXISTING UTILITIES AND STRUCTURES: The existence and location of underground utilities will be investigated and verified in the field by the Contractor before starting work. The Contractor shall call for underground utility locations. Underground utilities location service can be contacted at 1-888-721-7877 (SC). The location of all known interferences based on the best information available has been shown on the drawings, but this information may not be complete. Excavation in the vicinity of existing structures and utilities shall be carefully done by hand. The Contractor shall be held responsible for any damage to and for maintenance and protection of existing utilities and structures. The Contractor is responsible for coordinating with the utility companies any relocation, adjustment, or replacement of utility facilities.

SC-18 INTERRUPTION OF UTILITY SERVICE: The Contractor's operations shall be conducted to interfere as little as possible with utility services. Any proposed interruption by the Contractor must be accepted in advance by the Engineer.

SC-19 OMISSION: The drawings and specifications shall both be considered as a part of the contract. Any work and material shown in the one and omitted in the other or described in

the one and not shown in the other, or which may fairly be implied by both or either, shall be furnished and performed as though shown in both, in order to give a complete and first class job.

SC-20 MEASUREMENT AND PAYMENT: Measurement and payment shall be made for the units and at the lump sum contract prices shown on the Bid Schedule. Direct payment shall only be made for those items or work specifically listed in the proposal and the cost of any other work must be included in the contract price for the applicable items to which it relates.

SC-21 "OR EQUIVALENT," CLAUSE: Although the plans and specifications make reference to particular manufacturers and model numbers for various products, such reference is made only to establish function and quality of such products. If it is desired to use materials or equipment of trade names or of manufacturer's names that are different from those mentioned in the contract documents, information pertaining to such items must reach the hands of the Engineer at least 10-days prior to the date set for the opening of bids. The burden of proving equality of a proposed substitute to an item designated by trade name or by manufacturer's name in the contract document rests on the party submitting the request for acceptance. The written application for review of a proposed substitute must be accompanied by technical data that the party requesting review desires to submit in support of its application. The Engineer will give consideration to reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed product with previous users or any other written information that is reasonable in the circumstances. The application to the Engineer for review of a proposed substitute must be accompanied by a schedule setting forth in what respects the material or equipment submitted for consideration differs from the materials or equipment designated in the contract documents. The degree of proof required for acceptance of a proposed substitute as equivalent to a named product is the amount of proof necessary to convince the Engineer beyond all doubt. To be acceptable, a proposed substitute must, in addition, meet or exceed all express requirements of the contract documents.

If submittal is accepted by the Engineer, an addendum will be issued to all prospective bidders at least five days prior to the date set for the opening of bids.

The Engineer shall be the final judge on questions of similarity and equality.

SC-22 SAFETY AND HEALTH REGULATIONS: The Contractor shall comply with the Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 as amended through January 1, 2004 (PL 91-596) and under Section 107 of the Contract Work and Safety Standards Act (PL 91-54). The regulations are administered by the Department of Labor and the Contractor shall allow access to the project to personnel from that Department.

SC-23 RECORD DATA AND DRAWINGS: The Contractor shall keep accurate, legible records of the locations, types, and sizes of sanitary lines, service laterals, manholes, cleanouts, water lines, fittings, valves, hydrants, drainage pipes, drainage structures, and other related work performed under this project. Where proposed and existing utilities cross, the Contractor shall measure and record the horizontal location and vertical separation between each crossing. Separation shall be measured between exteriors of pipes. On a set of project prints provided by the Owner, the Contractor shall prepare a set of "record" drawings from the data stated above. The horizontal locations of all portions of items installed on this project shall be accurately tied down to features that are physical and visible, such as property corner markers and/or permanent type structures. Invert elevations of all

manholes, storm sewers and structures, sanitary sewers and lift stations shall be clearly indicated. These "record" drawings shall be kept clean and dry and maintained in a current state with the progress of the work. If at any time, a copy of this plan or portion of it is requested by the Owner, such copy shall be made available within 24-hours after the request is made.

Before final acceptance of the completed installation and final payment by the Owner, the Contractor shall deliver to the Engineer, four sets of "Record" Drawings accurately depicting the horizontal and vertical as-built data described in the above paragraph. "Record" drawings for the items installed on this project shall be certified by a licensed surveyor, other than Thomas & Hutton, registered in South Carolina. The size of the drawings shall be 24" x 36". The "Record" drawings shall have a coordinate system based on the South Carolina State Plane Coordinate System, East Zone, North American Datum of 1983 (NAD83). Elevations shall be based on the North American Vertical Datum of 1988 (NAVD 88). All measurements and coordinates shown shall use the U.S. Survey flood definition. Coordinates shall be shown on all drainage structures, sanitary sewer manholes, storm manholes/boxes, valve boxes/vaults, valve manholes, valves, fire hydrants, fittings, and all other related work performed under this contract. Vertical data including but not limited to, structure and manhole frame and inverts, pipe inverts, lift station frame, inverts, control levels, bottom, site grading, and as-built grading shall be shown. In addition to the "Record" drawings, Contractor shall deliver to Engineer electronic AutoCAD (v. 14 or later) files of all the data described above.

SC-24 PROPERTY CORNERS: The Contractor shall be responsible for restoring any property corners or monuments disturbed during construction. They shall be restored by a professional surveyor registered in the State of South Carolina.

SC-25 VIDEO: A video showing existing site conditions shall be made by the Contractor prior to start of construction. Contractor shall provide Owner and Engineer a copy of the video. Contractor is encouraged to record any existing damaged facilities that could be questioned later by property owners. A written or recorded narrative shall be provided with the video. Engineer shall be notified 72-hours in advance making the video. Contractor is responsible for all costs associated with video and shall be considered a subsidiary part of the contract.

DOCUMENT 00815**SUPPLEMENTARY CONDITIONS**

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC C-700, 2007 Edition) and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.

SC-1 The terms used in these Supplementary Conditions which are defined in the Standard General Conditions of the Construction Contract (EJCDC C-700, 2007 Edition) have the meanings assigned to them in the General Conditions.

SC-2.05.A.4 Add the following new paragraph to the General Conditions after paragraph 2.05.A.3:

4. "A schedule of anticipated shipping dates for materials and equipment. It is intended that equipment and materials be so scheduled as to arrive at the job site just prior to time for installation to prevent excessive materials on hand for inventory and necessity for extensive storage facilities at the job site."

SC-5.04.B.7 Add the following new paragraph to the General Conditions after paragraph 5.04.B.6:

7. Bonding surety shall be located in the state in which the work is being performed.

The Contractor shall not commence work under this contract until it has obtained all the insurance required under this paragraph and such insurance has been accepted by the Owner, nor shall the Contractor allow any Subcontractor to commence work on its subcontract until the insurance required of the Subcontractor has been so obtained and accepted.

a. Compensation and Employer's Liability Insurance: The Contractor shall take out and maintain during the life of the contract, the statutory Worker's Compensation and Employer's Liability Insurance for all of its employees to be engaged in work on the project under the contract and, in case such work is sublet, the Contractor should require the Subcontractor similarly to provide Worker's Compensation and Employer's Liability Insurance for all the latter's employees to be engaged in such work.

b. Bodily Injury Liability and Property Damage Liability Insurance: The Contractor shall take out and maintain during the life of the contract, Bodily Injury Liability and Property Damage Liability Insurance. The policy shall protect Contractor and any Subcontractor performing work covered by the contract from claims for damages or personal injury, including accidental death, a well as from claims for property damage, which may arise from

operations under the contract, whether such operations be by Contractor, Subcontractor, or by anyone directly or indirectly employed by either of them and the amount of such insurance should be not less than:

- (1) Bodily Injury Liability Insurance, in an amount not less than \$1,000,000.00 for injuries, including wrongful death to any one person and subject to the same limit for each person in an amount not less than \$2,000,000.00 on account of one accident. Contractual liability should be endorsed on the policy.
- (2) Property Damage Insurance in an amount not less than \$1,000,000.00 for damages on account of any one accident, and in an amount not less than \$2,000,000.00 for damages on account of all accidents.

- c. Builder's Risk Insurance (Fire and Extended Coverage): The Contractor shall have adequate fire and standard extended coverage, with a company or companies acceptable to the Owner, in force on the project.

The provisions with respect to Builder's Risk Insurance shall in no way relieve the Contractor of its obligation of completing the work covered by the Contract.

- d. Proof of Carriage of Insurance: The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations, effective dates, and date of expiration of policies. Such certificates shall contain substantially the following statement: "The insurance covered by this certification shall not be canceled or materially altered, except after 10 days written notice has been received by the Owner."

SC-6.02.B Add the following:

The Contractor shall provide in writing any requests to work on weekends. Requests shall be submitted to the Owner and Engineer for consideration a minimum of 48-hours prior to the requested weekend.

SC-6.08 Add the following:

The Contractor shall not proceed until all encroachment permits, curb cut permits, highway crossing permits, and railroad crossing permits have been secured. Contact Owner to ascertain status of permits.

SC-6.09.D Add a new paragraph after paragraph 6.09.C of the General Conditions that reads as follows:

"D. The Contractor shall comply with the Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 as amended through January 1, 2004 (PL

91-596) and under Section 107 of the Contract Work and Safety Standards Act (PL 91-54). The regulations are administered by the Department of Labor and the Contractor shall allow access to the project to personnel from that Department.

The Bidder's attention is directed to the fact all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout and they will be deemed to be included in the contract the same as though herein written in full.

The Contractor shall keep fully informed of all laws, ordinances and regulations of Federal, State, City and County, in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over same. Contractor shall at all times, observe and comply with all such existing and future laws, ordinances, and regulations."

SC-6.12.B Add a new paragraph after paragraph 6.12.A of the General Conditions that is to read as follows:

"B. Record Data Drawings:

1. The Contractor shall keep accurate, legible records of the elevations, locations, types, and sizes of sanitary sewage lines, service laterals, manholes, cleanouts, water lines, fittings, valves, hydrants, drainage pipes, drainage structures, and other related work performed under this project. Where proposed and existing utilities cross, the Contractor shall measure and record the horizontal location and vertical separation between each crossing. Separation shall be measured between exteriors of pipes. On a set of project prints provided by the Owner, the Contractor shall prepare a set of "record" drawings from the data stated above. The horizontal locations of all portions of items installed on this project shall be accurately tied down to the State Plane Coordinate System. Invert and frame elevations of all manholes, storm sewers and structures, sanitary sewers and lift stations shall be clearly indicated. These "record" drawings shall be kept clean and dry and maintained in a current state with the progress of the work. If at any time, a copy of this plan or portion of it is requested by the Owner, such copy shall be made available within 24-hours after the request is made.
2. Before final acceptance of the completed installation and before final payment by the Owner, the Contractor shall deliver to the Engineer a completed set of "record" drawings accurately depicting the data described above. The horizontal and vertical locations as shown on the "record" drawings for the items installed on this project shall be certified by a licensed surveyor, other than Thomas & Hutton, registered in the State in which the project is located. "Record" Drawings shall be submitted on a marked up set of project construction prints or electronically. Thomas & Hutton shall prepare

original "record" drawings from the submitted data. When completed, Thomas & Hutton shall have the licensed surveyor stamp and sign the original "record" drawings before making copies available to the Owner or other appropriate agencies."

SC-6.13.A.3 Add the following:

"Safely guard the Owner's property from damages, injury, or loss in connection with this contract. Contractor shall at all times guard and protect its own work and all materials of every description both before and after being used in the work.

Contractor shall provide any enclosing or special protection from weather deemed necessary by Engineer without additional cost to the Owner. Partial payments under the contract will not relieve the Contractor from responsibility for protection of material, work, and property."

SC-9.02.C Add a new paragraph after paragraph 9.02.B of the General Conditions that is to read as follows:

"C. If at any time before the commencement or during the progress of the work, tools, plant or equipment appear to the Engineer to be insufficient, inefficient, or inappropriate to secure the quality of the work required or the proper rate of progress, the Engineer may order the Contractor to increase their efficiency, to improve their character, to augment their number, or to substitute new tools, plant or equipment as the case may be, and the Contractor must conform to such order; but a failure of the Engineer to demand such increase or efficiency, number, or improvements, shall not relieve the Contractor's obligation to secure the quality of work and the rate of progress necessary to complete the work within the time required by this contract to the satisfaction of the Owner."

SC-9.05 Add the following sentence at the end of paragraph 9.05 of the General Conditions:

"Owner and Engineer have the right to reject defective materials. Defective materials shall not be used in the work."

SC-13.03.A Add the following sentences to paragraph 13.03.A of the General Conditions:

"The Contractor will be required to maintain all work in a condition acceptable to the Engineer for a 30-day operating period after the same has been completed as a whole, and the Engineer has notified the Contractor in writing that the work has been finished. The Contractor shall give the Project Engineer or Project Representative a minimum of 48-hours' notice for all required observations and tests."

END OF SUPPLEMENTARY CONDITIONS

INDEX TO
SECTION 01011
SUMMARY OF WORK

Paragraph	Title	Page
PART 1 – GENERAL		
1.1	Section Includes	01011-1
1.2	Contract Description	01011-1
1.3	Work Required	01011-1
1.4	Contract Drawings	01011-2
1.5	Contract Technical Specifications	01011-2
1.6	Work Schedule	01011-2

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

SECTION 01011
SUMMARY OF WORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Contract Description.
- B. Work required by Contract.
- C. Contract Drawings.
- D. Contract Technical Specifications.
- E. Work Schedule.

1.2 CONTRACT DESCRIPTION

- A. Contract Type: 00506 - Agreement

1.3 WORK REQUIRED

- A. Consists of Contractor furnishing all labor, materials, tools, equipment and incidentals to complete the Work generally described below:

The extension of approximately 1,315 LF of the existing Saluda Commerce Park entrance road and associated clearing, grading and drainage. This project will also include the installation of approximately 2,370 LF of 8" water line, 1,775 LF of 8" sewer line, and associated utility appurtenances.

- B. All work shall be performed as shown on the Drawings and as described in the Contract Documents and Technical Specifications.
- C. All work shall comply with standards described by the Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1926, Subpart P, latest revision.

1.4 CONTRACT DRAWINGS

Sheet	Description
CS0.1	COVER SHEET
G0.1	GENERAL NOTES AND INDEX
EX1.1	EXISTING CONDITIONS & DEMOLITION PLAN
EC0.1	EROSION CONTROL NOTES
EC0.2	EROSION CONTROL NOTES
EC1.1	EROSION CONTROL PLAN
EC4.0	EROSION CONTROL DETAILS
EC4.1	EROSION CONTROL DETAILS
C0.1	TYPICAL ROADWAY SECTIONS

Sheet	Description
C3.2	PAVING GRADING AND DRAINAGE PLAN
C3.3	ROAD PROFILE
C4.1	STAKING, STRIPING, AND SIGNAGE PLAN
C4.2	TRAFFIC CONTROL PLAN
C4.3	PAVING GRADING AND DRAINAGE DETAIL
C4.4	PAVING GRADING AND DRAINAGE DETAIL
C4.5	STORM WATER PROFILE
C5.1	UTILITY PLAN
C5.2	SEWER PROFILE
C5.3	SEWER PROFILE
C5.4	WATER PROFILES
C5.5	WATER PROFILES
C5.6	WATER DETAILS
C5.7	WATER DETAILS
C5.8	SEWER DETAILS
XC1	ROAD CROSS SECTIONS
XC2	ROAD CROSS SECTIONS

1.5 CONTRACT TECHNICAL SPECIFICATIONS

- A. As listed in the Table of Contents.

1.6 WORK SCHEDULE

- A. Construct Work in stages to accommodate Owner's requirements during the construction period, coordinate construction schedule and operations with Owner and Engineer.
- B. Any disruption to utility services shall be scheduled in advance with local utility.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

Not used

END OF SECTION

SECTION 01012

SOIL INVESTIGATION DATA FOR BIDDERS

Paragraph	Title	Page
PART 1 – GENERAL		
1.1	Description	01012-1
1.2	Soil Investigation Data	01012-1

PART 2 – PRODUCTS

See attached report in Appendix A.

PART 3 – EXECUTION

None in this Section

SECTION 01012**SOIL INVESTIGATION DATA FOR BIDDERS****PART 1 – GENERAL****1.1 DESCRIPTION**

- A. This section includes subsurface data logs for information only.

1.2 SOIL INVESTIGATION DATA

- A. Subsurface data logs are available for information only. Actual conditions may vary. If bidders are not satisfied with accuracy and completeness of all available data, they are at liberty to make borings or perform soil investigation work for their own use at its expense. If Contractor chooses to perform their own investigation, work shall be coordinated with the Engineer. Any results from Contractor's investigation shall be shared promptly with the Engineer. Owner reserves the right to share Contractor's investigation data with other potential bidders if information could affect bidding process.
- B. The boring logs and test results are for information of the Contractor. Owner and Engineer assume no responsibility for the information.

PART 2 – PRODUCTS

See attached report.

PART 3 – EXECUTION

None this Section.

END OF SECTION

INDEX TO
SECTION 01025
MEASUREMENT AND PAYMENT

Paragraph	Title	Page
PART 1 - GENERAL		
1.1	Section Includes	01025-1
1.2	Authority	01025-1
1.3	Unit Quantities Specified	01025-1
1.4	Measurement of Quantities	01025-1
1.5	Payment	01025-2
PART 2 - PRODUCTS		
	Not Used	
PART 3 - EXECUTION		
	Not Used	

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Measurement and payment criteria applicable to the Work performed under a unit price payment method.

1.2 AUTHORITY

- A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
- B. Assist by providing necessary equipment, workers, and survey personnel as required.

1.3 UNIT QUANTITIES SPECIFIED

- A. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit sum/prices contracted.

1.4 MEASUREMENT OF QUANTITIES

- A. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
- B. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
- C. Measurement by Area: Measured by square dimension using mean length and width or radius.
- D. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
- E. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

1.5 PAYMENT

- A. Payment Includes: Full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work including overhead and profit.

- B. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the Engineer multiplied by the unit sum/price for Work which is incorporated in or made necessary by the Work.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

INDEX TO
SECTION 01300
SUBMITTALS

Paragraph	Title	Page
PART 1 – GENERAL		
1.1	Section Includes	01300-1
1.2	Related Sections	01300-1
1.3	Submittal Procedures	01300-1
1.4	Construction Progress Schedules	01300-2
1.5	Product Data	01300-2
1.6	Shop Drawings	01300-3
1.7	Samples	01300-4
1.8	Design Data	01300-4
1.9	Test Reports	01300-4
1.10	Certificates	01300-4
1.11	Manufacturer's Instructions	01300-5
1.12	Manufacturer's Field Reports	01300-5
1.13	Erection Drawings	01300-5
1.14	Reviewed Shop Drawings	01300-5
1.15	Submittal Checklist	01300-6

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

SECTION 01300 – SUBMITTALS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Product Data.
- D. Shop Drawings.
- E. Samples.
- F. Design data.
- G. Test reports.
- H. Certificates.
- I. Manufacturer's instructions.
- J. Manufacturer's field reports.
- K. Erection drawings.

1.2 RELATED SECTIONS

- A. Section 01400 – Quality Control: Manufacturers' field services and reports.
- B. Section 01702 – Closeout Procedures: Contract warranties, bonds, and closeout submittals.

1.3 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer accepted form.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix. Resubmit as specified for initial submittal. Indicate on revised drawings all changes that have been made other than those requested by the Engineer.
- C. Identify Project, Contractor, Subcontractor, or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed verifying review, approval, products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract

Documents. Submittal without the Contractor's stamp will be returned to Contractor without Engineer's review.

- E. Make all submittals far enough in advance of scheduled dates for installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery. In scheduling, allow sufficient time for the Engineer's review following the receipt of the submittal. Coordinate submission of related items. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- F. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed Work.
- G. Provide space for Contractor and Architect/Engineer review stamps.
- H. When revised for resubmission, identify all changes made since previous submission.
- I. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

1.4 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedule in duplicate within 15-days after date of Owner-Contractor Agreement.
- B. Revise and resubmit as required.
- E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- F. Indicate estimated percentage of completion for each item of Work at each submission.
- G. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by allowances.

1.5 PRODUCT DATA

- A. Product Data for Review:
 - 1. Submitted to Engineer for review and conformance with information given in specifications and the design concept expressed in contract documents.
 - 2. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above.
- B. Submit the number of copies Contractor and Owner require, plus two copies retained by Engineer.

- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, distribute in accordance with the Submittal Procedures article above.

1.6 SHOP DRAWINGS

- A. Contractor shall submit a minimum 2 copies of each shop drawing to the Engineer for review.
- B. Submitted to Engineer for review and conformance with information given in specifications and design concept expressed in contract documents. Review of shop drawings by Engineer shall not relieve Contractor of its responsibility for accuracy of shop drawings nor for furnishing of all materials and equipment required by the contract even though such items may not be indicated on shop drawings reviewed by Engineer.
- C. Shop drawings shall include applicable technical information, drawings, diagrams, performance curves, schedules, templates, calculations, instructions, measurements, and similar information as applicable to the specific item for which shop drawing is prepared.
- D. Do not use Engineer's Drawings for shop or erection purposes.
- E. Each shop drawing copy shall bear a Contractor's stamp showing they have been checked. Shop drawings submitted to the Engineer without Contractor's stamp will be returned to Contractor without review.

No review will be given to partial submittals of shop drawings for items which interconnect and/or are interdependent. It is the Contractor's responsibility to assemble shop drawings for all such interconnecting and/or interdependent items, check them and then make one submittal to Engineer.

Schedule of Submittals: Within 30 days of Contract award and prior to any shop drawing submittal, Contractor shall submit a schedule showing the estimated submittal date and desired acceptance date for each shop drawing anticipated. Time lost due to unacceptable submittals shall be the Contractor's responsibility.

1.7 SAMPLES

- A. Samples for Review:
 - 1. Submitted to Engineer for review and conformance with information given in specifications and design concept expressed in contract documents.

2. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above.
- B. Samples for Information:
 1. Submitted for Engineer's knowledge as contract administrator or for the Owner.
 - C. Include identification on each sample, with full product information.
 - D. Submit the number of samples specified in individual specification sections; one of which will be retained by Engineer.
 - E. Reviewed samples which may be used in the Work are indicated in individual specification sections.
 - F. Samples will not be used for testing purposes unless specifically stated in the specification section.

1.8 DESIGN DATA

- A. Submit for Engineer's knowledge as contract administrator or for the Owner.
- B. Submit for information and conformance with information given in specifications and design concept expressed in contract documents.

1.9 TEST REPORTS

- A. Submit for Engineer's knowledge as contract administrator or for the Owner.
- B. Submit test reports for information and assessing conformance with information given in specifications and design concept expressed in contract documents.

1.10 CERTIFICATES

- A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or the Contractor to Engineer, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.

1.11 MANUFACTURER'S INSTRUCTIONS

- A. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- B. Refer to Section 01400 – Quality Control, Manufacturers' Field Services article.

1.12 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for Engineer's benefit as contract administrator or for the Owner.
- B. Submit report within 30 days of observation to Engineer for information.
- C. Submit for information and assessing conformance with information given in specifications and design concept expressed in contract documents.

1.13 ERECTION DRAWINGS

- A. Submit drawings for Engineer's benefit as contract administrator or for the Owner.
- B. Submit for information and assessing conformance with information given in specifications and design concept expressed in contract documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by the Engineer or Owner.

1.14 REVIEWED SHOP DRAWINGS

- A. Engineer Review.
 - 1. Acceptable submittals will be marked "No Exceptions Taken." A minimum of three copies will be retained by the Engineer for Engineer's and Owner's use and remaining copies will be returned to Contractor.
 - 2. Submittals requiring minor corrections before the product is acceptable will be marked "Furnish as Corrected." Contractor may order, fabricate, and ship items included in submittals, provided the indicated corrections are made.
 - 3. Submittals marked "Revise and Resubmit" must be revised to reflect required changes and the initial review procedure repeated.
 - 4. The "Rejected" notation is used to indicate products not acceptable. Upon return of a submittal so marked, Contractor shall repeat the initial review procedure utilizing acceptable products.
 - 5. Only two copies of items marked "Revise and Resubmit" and "Rejected" will be reviewed and marked. One copy will be retained by Engineer and the other copy with all remaining unmarked copies will be returned to Contractor for resubmittal.

- B. No Work or products shall be installed without a drawing or submittal bearing the "No Exceptions Taken" or "Furnish as Corrected" notation. Contractor shall maintain at the job site a complete set of shop drawings bearing Engineer's stamp.
- C. Substitutions: In the event Contractor obtains Engineer's acceptance for use of products other than those listed first in Contract Documents, Contractor shall, at Contractor's own expense and using methods accepted by Engineer, make any changes to structures, piping and electrical work necessary to accommodate these products.
- D. Use of "No Exceptions Taken" or "Furnish as Corrected" notation on shop drawings or other submittals is general and shall not relieve Contractor of the responsibility of furnishing products of proper dimension, size, quality, quantity, materials, all performance characteristics, and to efficiently perform requirements and intent of Contract Documents. Engineer's review shall not relieve Contractor of the responsibility of errors of any kind on shop drawings. Review is intended only to assure conformance with design concept of the project and compliance with information given in Contract Documents.

1.15 SUBMITTAL CHECKLIST

- A. This checklist is not necessarily complete. Contractor is responsible to submit all items and materials as specified in each section.

Section	Submittal	Date Received by T & H	Accepted Submittal Returned to Owner/Contractor	Submittal Rejected & Returned	Comments
02204 – Earthwork					
	Borrow				
02210 – Soil Erosion Control					
	Silt Fence				
02231 – Aggregate Base Course					
	Aggregate				
	Prime				
02275 – Rip-Rap					
	Stone				
	Filter Fabric				

Section	Submittal	Date Received by T & H	Accepted Submittal Returned to Owner/Contractor	Submittal Rejected & Returned	Comments
02511 – Asphaltic Concrete Base Course					
	Asphalt Cement				
	Anti-Stripping Agent				
	Mix Design				
02512 – Asphaltic Concrete Binder/Surface Courses					
	Tack Coat				
	Asphalt Cement				
	Anti-Stripping Agent				
	Mix Designs				
02667SC – Water Distribution System					
	PVC Pipe – 4"Ø and Larger				
	PVC Pipe – Smaller than 4"Ø				
	D.I. Pipe				
	Tubing for Service Lateral				
	Fittings – PVC				
	Fittings – Compact D.I.				
	Gate Valve				
	2" Ball Valves				
	Air Release Valve				
	Air/Vacuum Valve				
	Combination Air Valve				
	Corporation Stops				

Section	Submittal	Date Received by T & H	Accepted Submittal Returned to Owner/Contractor	Submittal Rejected & Returned	Comments
	Curb Stops				
	Magnetic Marking Tape				
	Valve Boxes				
	Valve Box Collar				
	Hydrant Tees				
	Threaded Rod with Bitumastic Coating and Painting				
	Fire Hydrants				
	Restrained Joint Fittings				
	Service Saddles				
	Tapping Sleeves/Crosses				
	Tapping Valves				
	Backflow Prevention Devices				
	Tracing Wire				
	Service Pipe/Tubing				
	Casing Pipe				
02720 – Storm Drainage					
	Reinforced Concrete Pipe				
	Gaskets				
	Drainage Structures				
02731 – Wastewater Collection System					

Section	Submittal	Date Received by T & H	Accepted Submittal Returned to Owner/Contractor	Submittal Rejected & Returned	Comments
	Wetwell				
	Manholes & Interior Coating				
	Boots and S.S. Straps				
	Joint Wrap				
	Joint Sealant				
	Steps				
	Piping – PVC – Gravity				
	Fittings – PVC – Gravity				
	Fittings DI – Force Main				
	Frames & Covers				
	Valve Pit and Steps				
	Valve Pit Hatch Cover				
	Wetwell Hatch Cover				
	Pumps and Controls				
	Control Panel Enclosure and Mounting Materials				
	Frost-Proof Hydrant				
	Backflow Prevention Device				
	Fencing and Gate Hardware				
	Gate Valves/Plug Valves				
	Check Valves				

Section	Submittal	Date Received by T & H	Accepted Submittal Returned to Owner/Contractor	Submittal Rejected & Returned	Comments
	Air Release/Vacuum Valves				
	Vent Pipe				
	Hoist and Hoist Sockets				
	Lifting Chain/Cable				
	Pumps Mounts/Intermediate and Upper Guide Brackets				
	Quick Disconnect				
	Electrical W/Generator Hook-up				
	Tracing Wire				
	Magnetic Tape				
	Force Main Gauges				
	Signage (Emergency #'s etc.)				
02902 – Grassing					
	Seed Mix – Temporary				
	Seed Mix – Permanent				
	Fertilizer				
	Lime				

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

INDEX TO
SECTION 01400 – QUALITY CONTROL

Paragraph	Title	Page
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1.1	Section Includes	01400-1
1.2	Related Sections	01400-1
1.3	Quality Assurance - Control of Installation	01400-1
1.4	Tolerance	01400-1
1.5	References and Standards	01400-2
1.6	Testing Services	01400-2
1.7	Manufacturer's Field Services	01400-3
PART 2 – PRODUCTS		
	Not Used	
PART 3 – EXECUTION		
3.1	Examination	01400-3
3.2	Preparation	01400-3

SECTION 01400
QUALITY CONTROL

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance - control of installation.
- B. Tolerances
- C. References and standards.
- D. Testing laboratory services.
- E. Manufacturer's field services.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals: Submission of manufacturer's instructions and certificates.
- B. Section 01410 - Testing Services.

1.3 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturer's instructions, including each step in sequence.
- C. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.4 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

- B. Comply with manufacturer's tolerances. Should manufacturer's tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust products to appropriate dimensions and position before securing in place.
- D. Accessible routes shall not exceed maximum ADA allowable slopes.

1.5 REFERENCES AND STANDARDS

- A. For products or workmanship specified by association, trade, or other consensus standards, complies with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current with date specified in the individual specification sections, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. Neither the contractual relationships, duties, nor responsibilities of the parties in Contract or those of the Architect/Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.6 TESTING SERVICES

- A. Owner will appoint, employ, and pay for specified services of an independent firm to perform testing. Contractor shall pay for all retesting of failed tests.
- B. The independent firm will perform tests and other services specified in individual specification sections and as required by the Owner.
- C. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Owner.
- D. Reports will be submitted by the independent firm to the Engineer and Contractor, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify Architect/Engineer and independent firm 48 hours prior to expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- F. Testing does not relieve Contractor to perform Work to contract requirements.

- G. Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for re-testing will be made by the Contractor.

1.7 MANUFACTURER'S FIELD SERVICES

- A. Report observations and site decisions or instructions given to applicators or installers supplemental or contrary to manufacturer's written instructions.
- B. Refer to Section 01300 - SUBMITTALS, MANUFACTURER'S FIELD REPORTS article.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of the correct characteristics, and in the correct locations.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

INDEX TO
SECTION 01410 - TESTING SERVICES

Paragraph	Title	Page
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1.1	Section Includes	01410-1
1.2	Related Sections	01410-1
1.3	References	01410-1
1.4	Selection and Payment	01410-2
1.5	Quality Assurance	01410-2
1.6	Contractor Submittal	01410-2
1.7	Testing Agency Responsibilities	01410-3
1.8	Testing Agency Reports	01410-3
1.9	Limits on Testing Authority	01410-3
1.10	Contractor Responsibilities	01410-4
1.11	Schedule of Tests	01410-4

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

SECTION 01410

TESTING SERVICES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Selection and payment.
- B. Contractor submittals.
- C. Testing agency responsibilities.
- D. Testing agency reports.
- E. Limits on testing authority.
- F. Contractor responsibilities.
- G. Schedule of tests.

1.2 RELATED SECTIONS

- A. Testing and approvals required by public authorities.
- B. Section 01300 – Submittals: Manufacturer's certificates.
- C. Section 01400 – Quality Control.
- D. Section 01702 – Contract Closeout: Project record documents.

1.3 REFERENCES (LATEST REVISION)

- A. ASTM C 802 – Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods for Construction Materials.
- B. ASTM C 1077 – Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- C. ASTM C 1093 – Practice for Accreditation of Testing Agencies for Masonry.
- D. ASTM D 3740 – Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- E. ASTM D 4561 – Practice for Quality Control Systems for Organizations Producing and Applying Bituminous Paving Materials.
- F. ASTM E 329 – Specification for Agencies Engaged in Construction Inspection and/or Testing.

- G. ASTM E 543 – Practice for Agencies Performing Nondestructive Testing.
- H. ASTM E 548 – Guide for General Criteria Used for Evaluating Laboratory Competence.
- I. ASTM E 699 – Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components.

1.4 SELECTION AND PAYMENT

- A. Owner will employ and pay for services of an independent testing agency or laboratory to perform specified testing. Contractor shall pay for all retesting of failed tests.
- B. Employment of testing agency or laboratory in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

1.5 QUALITY ASSURANCE

- A. Comply with requirements of practices listed in paragraph 1.3.
- B. Laboratory: Authorized to operate in State in which project is located.
- C. Laboratory Staff: Maintain a full-time registered Engineer on staff to review services.
- D. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.6 CONTRACTOR SUBMITTALS

- A. Prior to start of Work, submit testing laboratory name, address, and telephone number, and names of full-time registered Engineer and responsible officer.
- B. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.7 TESTING AGENCY RESPONSIBILITIES

- A. Test samples of mixes submitted by Contractor.
- B. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
- C. Perform specified sampling and testing of products in accordance with specified standards.
- D. Ascertain compliance of materials and mixes with requirements of Contract Documents.

- E. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
- F. Perform additional tests required by Engineer.
- G. Attend preconstruction meetings and progress meetings.

1.8 TESTING AGENCY REPORTS

- A. After each test, promptly submit two copies of report to Engineer and to Contractor.
- B. Include:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Name of inspector.
 - 4. Date and time of sampling or inspection.
 - 5. Identification of product and specifications section.
 - 6. Location in the Project.
 - 7. Type of inspection or test.
 - 8. Date of test.
 - 9. Results of tests.
 - 10. Conformance with Contract Documents.
- C. When requested by Engineer, provide interpretation of test results.

1.9 LIMITS ON TESTING AUTHORITY

- A. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Agency or laboratory may not approve or accept any portion of the Work.
- C. Agency or laboratory may not assume any duties of Contractor.
- D. Agency or laboratory has no authority to stop the Work.

1.10 CONTRACTOR RESPONSIBILITIES

- A. Deliver to agency or laboratory at designated location, adequate samples of materials proposed to be used requiring testing, along with proposed mix designs.
- B. Cooperate with laboratory personnel and provide access to the work and to manufacturer's facilities.
- C. Provide incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To obtain and handle samples at the site or at source of products to be tested.
 - 3. To facilitate tests.
 - 4. To provide storage and curing of test samples.

- D. Notify Engineer and laboratory 48-hours prior to expected time for operations requiring testing services.

1.11 SCHEDULE OF TESTS

Section	Test	Frequency	Date	Performed By	Notes
02204 – Earthwork					
	Compaction				
	Unpaved	1 test per horizontal layer per 10,000 sf of fill area			
	Paved	1 test per horizontal layer per 5,000 sf of subgrade			
	Curb & gutter	1 test per 300 lf			
	Proof Rolling	As necessary			
02231 – Aggregate Base Course					
	Base Density	1 test per 5,000 sf			
02511 – Asphaltic Concrete Base Course					
	Asphalt Extraction & Gradation	1 test per each 250 tons placed			
	Marshall Stability	1 test per each 250 tons placed			
	Core	1 test for each 250 tons placed			
	Field Density	1 test per 5,000 sf			
02512 – Asphaltic Concrete Binder/Surface courses					
	Asphalt Extraction & Gradation	1 test for each 250 tons placed			
	Marshall Stability	1 test for each 250 tons placed			
	Field Density	1 test for each 250 tons placed			
	Cores	1 test for each 250 tons placed			
02667 – Water Distribution System					
	Hydrostatic & Leakage	1.5 times the working pressure (no less than 150 psi). Conducted for 2 hours with maintained pressure of 150 psi (200 psi on fire main)			
	Bacteriologic Samples	2 taken 24 hours apart after disinfection			
	Compaction				
	Traffic Areas	1 per 100 lf or less for each 4 ft. of depth			

Section	Test	Frequency	Date	Performed By	Notes
	Non-Traffic Areas	1 per 500 lf or less for each 4 ft. of depth			
	Fire Flow	1 per permit			
	Hydrostatic & Leakage	1.5 times the working pressure (no less than 150 psi). Conducted for 2 hours with maintained pressure of 150 psi (200 psi on fire main)			
02720 – Storm Drainage					
	Compaction				
	Traffic Areas	1 per 100 lf or less for each 4 ft. of depth			
	Non-Traffic	1 per 500 lf or less for each 6 ft. of depth			
02731 – Wastewater Collection System					
	Start-up	Prior to acceptance of Pump Station			
	Drawdown	Prior to acceptance of Pump Station			
	Certification	Completion			
	Warranty	Completion			
	Television Inspection of Sewers	As requested			
	Leakage	As necessary			
	Compaction				
	Traffic Areas	1 per 100 lf or less for each 4 ft. of depth			
	Non-Traffic Areas	1 per 500 lf or less for each 6 ft. of depth			
	Gravity – Air	[All lines]			
	Hydrostatic – Force Main	100 psi for 2 hours			
	Deflection	10% of system			

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

INDEX TO
SECTION 01702 – CONTRACT CLOSEOUT

Paragraph	Title	Page
PART 1 – GENERAL		
1.1	Section Includes	01702-1
1.2	Related Sections	01702-1
1.3	Closeout Procedures	01702-1
1.4	Final Cleaning	01702-1
1.5	Adjusting	01702-1
1.6	Project Record Documents	01702-2
1.7	Operation and Maintenance Data	01702-2
1.8	Spare Parts and Maintenance Products	01702-3
1.9	Warranties and Bonds	01702-3
1.10	Maintenance Service	01702-3

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

SECTION 01702
CONTRACT CLOSEOUT

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Project record documents.
- C. Operation and maintenance data.
- D. Warranties and bonds.
- E. Maintenance service.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals
- B. Operation and Maintenance Data.
- C. Warranties.
- D. Bonds.

1.3 CLOSEOUT PROCEDURES

- A. Submit written verification Contract Documents being reviewed, Work has been observed at appropriate times, and Work is complete in accordance with Contract Documents and ready for Engineer's review.
- B. Provide submittals to Owner required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.4 FINAL CLEANING

- A. Execute final cleanup prior to final project assessment.
- B. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.5 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

1.6 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, Product Data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Equipment Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
 - 4. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
- F. Project Record Drawings [and Shop Drawings]: Legibly mark each item to record actual construction including:
 - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 3. Where proposed and existing utilities cross, the Contractor shall measure and record the horizontal location and vertical separation between each crossing. Separation shall be measured between exteriors and pipes.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract drawings.
 - 6. Piling data locations, tip and cut-off elevations, and driving records.

1.7 OPERATION AND MAINTENANCE DATA

OMITTED

1.8 SPARE PARTS AND MAINTENANCE PRODUCTS

OMITTED

1.9 WARRANTIES AND BONDS

- A. Provide duplicate notarized copies.
- B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.
- C. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.
- D. Submit prior to final Application for Payment.

1.10 MAINTENANCE SERVICE

OMITTED

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

INDEX TO
SECTION 01741 – BONDS

Paragraph	Title	Page
PART 1 – GENERAL		
1.1	Section Includes	01741-1
1.2	Related Sections	01741-1
1.3	Form of Submittals	01741-1
1.4	Preparation of Submittals	01741-1
1.5	Time of Submittals	01741-2
1.6	Schedule of Submittals – Omitted	01741-2

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

SECTION 01741

BONDS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Preparation and submittal of bonds.
- B. Time and schedule of submittals.

1.2 RELATED SECTIONS

- A. Document 00110 - Instruction to Bidders: Bid bonds.
- B. Document General Conditions - EJCDC: Performance bond and labor and material payment bonds.
- C. Section 01702 - Contract Closeout: Contract closeout procedures.
- D. Individual Specifications Sections: Bonds required for specific Products or Work.

1.3 FORM OF SUBMITTALS

- A. Bind in commercial quality 8-1/2 x 11 binders with durable plastic covers.
- B. Cover: Identify each binder with typed or printed title BONDS with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- C. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of Product or work item.
- D. Separate each bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principals.

1.4 PREPARATION OF SUBMITTALS

- A. Obtain bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten (10) days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of bond until the Date of Substantial completion is determined.
- B. Verify documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.

D. Retain bonds until time specified for submittal.

1.5 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten (10) days after acceptance.

1.6 SCHEDULE OF SUBMITTALS

OMITTED

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

INDEX TO
SECTION 02110 – SITE CLEARING

Paragraph	Title	Page
PART 1 – GENERAL		
1.1	Section Includes	02110-1
1.2	Related Sections	02110-1
1.3	Measurement and Payment	02110-1
1.4	Regulatory Requirements	02110-1
PART 2 – PRODUCTS		
2.1	Materials	02110-1
PART 3 – EXECUTION		
3.1	Preparation	02110-2
3.2	Protection	02110-2
3.3	Clearing	02110-3
3.4	Removal	02110-3
3.5	Disposal	02110-3
3.6	Grubbing	02110-4

SECTION 02110**SITE CLEARING****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Removal of surface debris.
- B. Removal of paving and storm culverts.
- C. Removal of trees, shrubs, and other plant life.
- D. Topsoil excavation.

1.2 RELATED SECTIONS

- A. Section 02210 – Soil Erosion Control
- B. Section 02204 - Earthwork.

1.3 MEASUREMENT AND PAYMENT

- A. Measurement and payment for site clearing shall be made at the contract unit price. Work includes clearing site, removing trees and stumps, loading and removing waste materials from site.

1.4 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for environmental requirements, disposal of debris, use of herbicides, and demolition as required.
- B. Coordinate clearing Work with utility companies.
- C. Disposal of debris by burning will not be allowed.
- D. For clearing within the SCDOT Right-of-Way, Contractor shall adhere to the requirements of the approved SCDOT Encroachment Permit.

PART 2 – PRODUCTS**2.1 MATERIALS**

OMITTED

PART 3 – EXECUTION

3.1 PREPARATION

- A. Identify an off-site salvage area for placing removed materials.

3.2 PROTECTION

- A. Protect bench marks, survey control points, and existing structures from damage or displacement.
- B. Protect all remaining utilities.
- C. Clearing operations shall be conducted to prevent damage by falling trees to trees left standing, to existing structures and installations, and to those under construction, and to provide for the safety of employees and others.

3.3 CLEARING

- A. Clear areas required for access to site and execution of work. Clearing shall consist of felling and cutting trees into sections, and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within area to be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be removed completely from the site, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within cleared areas shall be trimmed of dead branches 1-1/2 inch or more in diameter. Limbs and branches to be trimmed shall be neatly cut close to the trunk of the tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an accepted treewound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations, by the erection of timber barriers or by such other means as circumstances require. Such barriers must be placed and be checked by the OWNER before construction observations can proceed (See 3.2). Clearing shall also include removal and disposal of structures obtruding, encroaching upon, or otherwise obstructing the work.

3.4 REMOVAL

- A. Where indicated or directed, trees and stumps shall be removed from areas outside those areas designated for clearing and grubbing. Work shall include felling of such trees and removal of their stumps and roots. Trees shall be disposed of as hereinafter specified.
- B. Remove debris, rock, and other extracted plant life from site.

3.5 DISPOSAL

- A. Disposal of trees, branches, snags, brush, stumps, etc., resulting from clearing and grubbing shall be the Contractor's responsibility and shall be disposed of by removal from site. Disposal by burning will not be allowed. Contractor shall be responsible for compliance with all local and State laws and regulations relative

to the disposal of cleared debris. All liability of any nature resulting from disposal of cleared and grubbed material shall become the Contractor's responsibility. Disposal of all materials cleared and grubbed will be in accordance with rules and regulations of the State of South Carolina.

3.6 GRUBBING

- A. Grubbing shall consist of removal and disposal of stumps, roots larger than one inch in diameter, and matted roots from designated grubbing areas. This material, together with logs and other organic or metallic debris not suitable for building of pavement subgrade or building pads, shall be excavated and removed to a depth of not less than 18-inches below original surface level of the ground in embankment areas and not less than 2-feet below finished earth surface in excavated areas. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform to original adjacent ground. There will be no measurement or payment for this suitable material replacement and shall be included within the unit price for site clearing.

END OF SECTION

INDEX TO
SECTION 02111 – SITE PREPARATION

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1.1	Summary	02111-1
1.2	Related Requirements	02111-1
1.3	Protections	02111-1
PART 2 – PRODUCTS		
	Not Used	
PART 3 – EXECUTION		
3.1	Clearing or Removal of Trees and Other Vegetation	02111-2

SECTION 02111
SITE PREPARATION

Paragraph

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Protection or removal of trees and other vegetation.
 - 2. Topsoil stripping.
 - 3. Clearing and grubbing.
 - 4. Erosion control.

1.2 RELATED REQUIREMENTS

- A. Construction Drawings
- B. Section 02210 – Site Clearing
- C. Section 02210 – Soil Erosion Control

1.3 PROTECTIONS

- A. Provide protection necessary to prevent damage to existing improvements, trees, or vegetation indicated on the Contract Documents to remain.
- B. Protect improvements on adjoining properties and on Owner's property.
- C. Restore damaged improvements to original condition as acceptable to parties having jurisdiction.
- D. Conduct operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction and from Owner. Streets and roadways shall be thoroughly cleaned and/or swept on a daily basis or more frequently as required by the governing authority.
- E. Provide traffic control as required, in accordance with the Federal Highway Administration (FHWA) "Manual of Uniform traffic Control Devices" and the state highway department requirements.
- F. Provide necessary erosion control measures to prevent siltation of existing pavement or storm drainage facilities to remain.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION**3.1 CLEARING AND REMOVAL OF TREES AND OTHER VEGETATION**

- A. Unless otherwise indicated on the drawings, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction within the limits of work. Removal includes digging out stumps and roots. Do not remove items elsewhere on site or premises unless specifically indicated. Disposal of debris by burning will not be allowed.

- A. Strip topsoil to whatever depths encountered to prevent intermingling with underlying subsoil or other objectionable material. Cut heavy growths of grass from areas before stripping. Topsoil shall consist of sandy clay surficial soil found in depth of not less than 6-inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2-inches in diameter, weeds, roots, and other objectionable material.

- B. Stockpile topsoil in storage piles in areas shown or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent windblown dust. Dispose of unsuitable or excess topsoil same as specified for waste material, unless otherwise specified by Owner.

- C. Completely remove stumps, roots, and other debris below proposed subgrade elevation. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is required. Place fill material in horizontal layers not exceeding 8-inches loose depth, and thoroughly compacted per fill requirements of this section.

- D. Remove existing above grade and below grade improvements and abandoned underground piping or conduit necessary to permit construction and other work.

END OF SECTION

INDEX TO
SECTION 02204 – EARTHWORK

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1.1	Section Includes	02204-1
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3.3	Ground Surface Preparation for Fill	02204-5
3.4	Fill	02204-5
3.5	Finished Grading	02204-5
3.6	Disposal of Waste Material	02204-6
3.7	Protection	02204-6
3.8	Drainage	02204-7
3.9	Field Quality Control	02204-7
3.10	Proof Rolling	02204-7

SECTION 02204**EARTHWORK****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Grading
- B. Excavation
- C. Backfilling
- D. Compaction
- E. Remove and Replace Topsoil
- F. Dressing of Shoulders and Banks
- G. Stone Drainage Filter
- H. Water Control
- I. Testing

1.2 RELATED SECTIONS

- A. Section 01012 – Soil Investigation for Bidders
- B. Section 01400 – Quality Control
- C. Section 01410 – Testing Services
- D. Section 02110 – Site Clearing
- E. Section 02111 – Site Preparation
- F. Section 02210 – Soil Erosion Control

1.3 MEASUREMENT AND PAYMENT

- A. Grading to subgrades, construction of ditches, dressing of disturbed areas, removing and replacing topsoil, excavating, backfilling and compacting to required elevations shall be included in the contract unit price for "Fine Grading."
- B. Unsuitable Material - Payment will be made on a contract unit price for each cubic yard removed. Payment will include excavation and disposal of unsuitable material.

- C. Borrow - Payment will be made on a contract unit price for each cubic yard in place. Payment will include furnishing materials required in excess of suitable materials available on site.
- D. Earthwork - All earthwork associated with the installation of bulkheads, headwalls, wingwalls, weir structures, drainage filters, rip-rap, etc. shall not be measured for direct payment. Payment for the earthwork shall be included in the item to which it pertains.
- E. Dewatering - No direct payment shall be made for dewatering. Dewatering shall be included in the item to which it pertains.
- F. Proof Rolling - Payment will be made at the contract unit price. Payment will include furnishing a loaded truck, truck driver, fuel and rolling the designated areas.

1.4 REFERENCES (LATEST REVISION)

- A. ASTM D 448 – Sizes of Aggregate for Road and Bridge Construction.
- B. ASTM D 698 – Laboratory Compaction Characteristics of Soil Using Standard Effort.
- C. ASTM D 2487 – Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- D. ASTM D 6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- E. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- F. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.

1.5 SUBMITTALS

- A. Section 01300 - Submittals: Procedures for submittals.
- B. Materials Source: Submit gradation analysis, proctor results, and soil classification for all borrow material.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with SCDOT, SCDES, and Saluda County standards.

1.7 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 698, (Standard Proctor).
- B. In place density tests in accordance with ASTM D 6938.

- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. The testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours' notice prior to taking any of the tests.
- E. Owner shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all tests shall be by the Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of testing laboratory when:
 - 1. Contractor gives notice the work is ready for inspection and testing, and fails to be ready for the test, and/or
 - 2. Testing of the Contractor's work, products or materials fail, and retesting is required, and/or
 - 3. Contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Borrow shall consist of sand or sand-clay soils capable of being readily shaped and compacted to the required densities, and shall be reasonably free of roots, trash, rock larger than 2-inches, and other deleterious material.
- B. All soils used for structural fills shall have a PI (plastic index) of less than 10, and a LL (liquid limit) of less than 30. Fill soils shall be dried or wetted to appropriate moisture contents prior to compaction. Additionally, fill soils used for the top 2-feet of fill beneath roads and parking lots shall have no more than 15% passing the # 200 sieve. Fill soils used for house lots shall have no more than 25% passing the # 200 sieve.
- C. Contractor shall furnish all borrow material.
- D. Contractor shall be responsible for and bear all expenses in developing borrow sources including securing necessary permits, drying the material, haul roads, clearing, grubbing, excavating the pits, placing, compaction and restoration of pits and haul roads to a condition satisfactory to property owners and in compliance with applicable federal, state, and local laws and regulations.

2.2 SOURCE QUALITY CONTROL

- A. If tests indicate materials do not meet specified requirements, change material and retest.

- B. Provide materials of each type from same source throughout the Work.

PART 3 – EXECUTION

3.1 TOPSOIL

- A. Contractor shall strip topsoil and stockpile on site at a location determined by the Owner at the Contractor's expense. Topsoil shall be stockpiled in separate location from suitable excess material stockpile.
- B. Topsoil shall be placed to a depth of 4-inches over all disturbed or proposed landscaped areas.
- C. Topsoil shall be provided at Contractor's expense if it is not available from site.
- D. Any remaining topsoil will be hauled off site at the Contractors expense.
- E. Do not excavate wet topsoil.

3.2 EXCAVATION

- A. Suitable excavation material shall be transported to and placed in fill areas within limits of the work.
- B. Unsuitable material encountered in areas to be paved and under building pads, shall be excavated 2-feet below final grade and replaced with suitable material from site or borrow excavations. Contractor shall notify Engineer if more than 2-feet of excavation is needed to replace unsuitable material.
- C. Unsuitable material not required for fill shall be disposed of offsite. Suitable surplus excavation material shall be stockpiled on site, separate from topsoil stockpile, for use as future fill material.
- D. Proper drainage, including sediment and erosion control, shall be maintained at all times. Methods shall be in accordance with the National Pollutant Discharge Elimination System standards and other local, state, and federal regulations.
- E. Unsuitable materials as stated herein are defined as highly plastic clay soils, of the CH and MH designation, border line soils of the SC-CH description, and organic soils of the OL and OH description based on the Unified Soils Classification System. Further, any soils for the top two feet of pavement subbase shall have no more than 15% passing the # 200 sieve.

3.3 GROUND SURFACE PREPARATION FOR FILL

- A. All vegetation, roots, brush, heavy sods, heavy growth of grass, decayed vegetable matter, rubbish, and other unsuitable material within the areas to be filled shall be stripped and removed prior to beginning the fill operation.

- B. Sloped ground surfaces steeper than 1 vertical to 4 horizontal, on which fill is to be placed shall be plowed, stepped, or benched, or broken up as directed, in such a manner where fill material will bond with the existing surface.
- C. Surfaces on which fill is to be placed and compacted shall be wetted or dried as may be required to obtain the specified compaction.

3.4 FILL

- A. Shall be placed in successive horizontal layers not more than 8-inches in loose depth for the full width of the cross-section and compacted as required. Fill shall be placed in accordance with the Geotechnical Report found in Section 01012.

3.5 FINISHED GRADING

- A. All areas covered by the project including excavated and filled sections and adjacent transition areas shall be smooth graded and free from irregular surface changes.
- B. Degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations, supplemented with hand raking and finishing, except as otherwise specified.
- C. Unpaved areas to within 0.1-feet of elevations shown on the drawings provided such deviation does not create low spots that do not drain.
- D. Paved Areas - Subgrade to within 0.05-feet of the drawing elevations less the compacted thickness of the base and paving.
- E. Building Pads - Subgrade to within 0.05-feet of the drawing elevations less the thickness of the concrete slab.
- F. Ditches and pond banks shall be finished graded, dressed, and seeded within 14-calendar days of work to reduce erosion and permit adequate drainage.

3.6 DISPOSAL OF WASTE MATERIAL

- A. All vegetation, roots, brush, sod, broken pavements, curb and gutter, rubbish, and other unsuitable or surplus material stripped or removed from limits of construction shall be disposed of by the Contractor.

3.7 PROTECTION

- A. Graded areas shall be protected from traffic, erosion, settlement, or any washing away occurring from any cause prior to acceptance.
- B. Contractor shall be responsible for protection of below grade utilities shown on the drawings or indicated by the Owner at all times during earthwork operations.
- C. Repair or re-establishment of graded areas prior to final acceptance shall be at the Contractors expense.

- D. Site drainage shall be provided and maintained by Contractor during construction until final acceptance of the project. Drainage may be by supplemental ditching, or pumping if necessary, prior to completion of permanent site drainage.

3.8 DRAINAGE

- A. Contractor shall be responsible for providing surface drainage away from all construction areas. This shall include maintenance of any existing ditches or those constructed in the immediate vicinity of the work. Contractor shall provide proper and effective measures to prevent siltation of wetlands, streams, and ditches on both the Owner's property, and those properties downstream.

3.9 FIELD QUALITY CONTROL

- A. Compaction testing shall be performed in accordance with ASTM D 6938. Compaction requirements shall be in accordance with the Geotechnical Report found in Section 01012. Where tests indicate the backfill does not meet specified requirements, the backfill shall be reworked or removed and replaced, and then retested at the Contractor's expense.
- B. Unpaved areas - at least 95% of maximum laboratory density within 3% optimum moisture content, unless otherwise approved by the Engineer.
- C. Paved Areas and Under Structures - top 18-inch layer of subbase to at least 98% of maximum laboratory density within 3% optimum moisture content. Layers below top 18 inches shall be compacted to 95% of maximum laboratory density within 3% optimum moisture content.
- D. Rolling and compaction equipment and methods shall be subject to acceptance by the Engineer. Acceptance in no way relieves Contractor of the responsibility to perform in correct and timely means.
- E. Number of Tests - Under paved areas, no less than one density test per horizontal layer per 5,000 square feet of subbase shall be made. In unpaved areas, no less than one density test per horizontal layer per 10,000 square feet of fill area shall be made. Under curb and gutter, no less than one density test per every 300 linear feet. On building pads, no less than one density test per horizontal layer per 10,000 square feet of fill area shall be made.

3.10 PROOF ROLLING

- A. Shall be required on the subbase of all curb and gutter and paved areas and on the base of all paved areas where designated by the Engineer. Proof rolling shall take place after all underground utilities are installed and backfilled. The operation shall consist of rolling the subbase or base with a fully loaded 10 wheeled dump truck. A full load shall consist of 10 to 12-cubic yards of soil or rock. The dump truck shall be capable of traveling at a speed of two to five miles per hour and be in sound mechanical shape with no exhaust leaks or smoking from burning oil. The Engineer shall determine number of passes and areas rolled.

END OF SECTION

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SECTION 02210 – SOIL EROSION CONTROL

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SECTION 02210
SOIL EROSION CONTROL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions apply to this section.

1.2 DESCRIPTION OF WORK

- A. Extent of soil erosion control work includes all measures necessary to meet the requirements of this section.

Erosion and sediment control measures shall be installed prior to any construction activity.

Soil erosion and sediment control measures shall include all temporary and permanent means of protection and trapping soils of the construction site during land disturbing activity. Activity covered in this contract shall meet standards of NPDES General Permit for the state where work is performed.

1.3 PURPOSES

- A. Contractor is to achieve the following goals:
1. Minimize soil exposure by proper timing of grading and construction.
 2. Retain existing vegetation whenever feasible.
 3. Vegetate and mulch denuded areas as soon as possible.
 4. Divert runoff away from denuded areas.
 5. Minimize length and steepness of slopes when it is practical.
 6. Reduce runoff velocities with sediment barriers or by increasing roughness with stone.
 7. Trap sediment on site.
 8. Inspect and maintain erosion control measures.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of soil erosion control systems products of types and sizes required, whose materials have been in satisfactory use for not less than 5-years.

- B. Codes and Standards: Comply with all applicable Local, State and Federal Standards pertaining to soil erosion control.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instruction for soil erosion control materials and products.

1.6 MEASUREMENT AND PAYMENT

- A. Measurement and payment for will be paid for at the contract unit price for all silt fencing and erosion control management as indicated in the contract documents and installed in accordance with the Plans and Specifications. The cost of soil erosion control shall include all equipment, labor, materials, and maintenance necessary to comply with the State of South Carolina Erosion and Sediment Control Program.

PART 2 – PRODUCTS

2.1 GRASSING MATERIALS

- A. Refer to Section 02902 - Grassing.
 - 1. General: All grass seed shall be free from noxious weeds, grade A recent crop, recleaned and treated with appropriate fungicide at time of mixture. Deliver to site in original sealed containers with dealer's guarantee as to year grown, percentage of purity, percentage of germination and date of the test by which percentages of purity and germination were determined. All seed sown shall have a date of test within six months of the date of sowing.
 - 2. Type of Seed: Either Annual Rye or Common Bermuda Grass seed will be used depending on time of year in which seeding is to occur.
 - 3. Mulch: Straw.
 - 4. Fertilizer: Commercial balanced 4-12-12 fertilizer.

2.2 SILT FENCE

- A. Silt fence shall be a woven geotextile fabric sheet. Fabric shall be a synthetic polymer composed of at least 85% by weight propylene, ethylene, amide, ester, or vinylidene chloride, and shall contain stabilizer and/or inhibitors added to the base plastic to make filaments resistant to deterioration due to ultra-violet and/or heat exposure. Fabric should be finished so the filaments will retain their relative position with respect to each other. Fabric shall be free of defects, rips, holes, or flaws.

Fabric shall meet the following requirements:

Woven Fabrics	
Grab Strength	90 lbs.
Burst Strength	175 PSI
UV Resistance	80%

2.3 CHEMICALS FOR DUST CONTROL

- A. Calcium Chloride, Anionic Asphalt Emulsion, latex Emulsion or Resin-in-Water Emulsion may be used for dust control.

2.4 RIP-RAP

- A. Shall be hard quarry or field stone of such quality the pieces will not disintegrate on exposure to water, sunlight, or weather. Stone shall range in weight from a minimum of 25-pounds to a maximum of 125-pounds. At least 50-percent of the stone shall weigh more than 60-pounds. The stone shall have a minimum dimension of 12-inches.

2.5 EROSION CONTROL BLANKET

OMITTED

2.7 TEMPORARY FLOATING SKIMMER

OMITTED

2.8 TEMPORARY POROUS BAFFLES

OMITTED

2.9 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products before they are ordered.

PART 3 – EXECUTION

3.1 GENERAL

- A. All disturbed soil areas except those to support paving shall be graded and protected from erosion by grassing. Disturbed areas must be grassed within 14-days of work ending unless work is to begin again before 21-days. Storm water conveyance systems shall have sediment barriers installed at all entrances, intersections, change in direction and discharge points.

3.2 GRASSING

- A. Refer to Section 02902 - Grassing.

3.3 SEDIMENT BARRIERS

OMITTED

3.4 SILT FENCE

- A. Silt fence shall be placed at approximate location shown and installed in accordance with the detail on the construction drawings. Contractor shall maintain silt fence as required by state regulations.

3.5 DUST CONTROL

- A. Dust raised from vehicular traffic will be controlled by wetting down access road with water or by the use of a deliquescent chemical, such as calcium chloride, if relative humidity is over 30%. Chemicals shall be applied in accordance with manufacturer's recommendations.
- B. Contractor shall use all means necessary to control dust on and near the work, or off-site borrow areas when dust is caused by operations during performance of work or if resulting from the condition in which any subcontractor leaves the site. Contractor shall thoroughly treat all surfaces required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of work on site.

3.6 SEDIMENT BASIN

OMITTED

3.7 RIP-RAP

- A. Rip-Rap shall be placed at the locations shown and installed in accordance with the detail on the construction drawings.

3.8 CONSTRUCTION EXIT

- A. Construct exit at the location shown per detail on the construction drawings. Contractor shall maintain construction exit as required by state regulations.

3.9 INLET PROTECTION

OMITTED

3.10 EROSION CONTROL BLANKET

OMITTED

3.11 TEMPORARY FLOATING SKIMMER

OMITTED

3.11 TEMPORARY POROUS BAFFLES

OMITTED

END OF SECTION

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SECTION 02231 - AGGREGATE BASE COURSE

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SECTION 02231
AGGREGATE BASE COURSE

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Aggregate base course.

1.2 RELATED SECTIONS

- A. Section 01025 - Measurement and Payment: Requirements applicable to unit prices for the work of this section.
- B. Section 01400 - Quality Control.
- C. Section 02204 - Earthwork
- D. Section 02512SC - Asphaltic Concrete Binder/Surface Courses

1.3 MEASUREMENT AND PAYMENT

- A. Aggregate Base Course: Payment will be made at the contract unit price. Payment will include supplying all material, labor, and equipment, stockpiling, scarifying substrate surface, placing where required, and compacting.
- B. Prime Coat: Bituminous prime coat will not be measured for separate payment. All costs connected with applying prime coat will be included in the unit price bid for Aggregate Base Course.

1.4 REFERENCES (LATEST REVISION)

- A. ASTM C 131 – Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
- B. ASTM D 1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort.
- C. ASTM D 6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- D. ASTM D 3740 – Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock Used in Engineering Design and Construction.
- E. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.

1.6 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with Section 305.4.3 of the SCDOT Standard Specifications for Highway Construction, latest edition.
- B. In place density tests in accordance with ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours' notice prior to taking any tests.
- E. Owner shall select and engage the Testing Laboratory. Testing Laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all tests shall be by the Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of Testing Laboratory when:
 - 1. Contractor gives notice the work is ready for inspection and testing, and fails to be ready for the test, and/or
 - 2. Testing of the Contractor's work, products, or materials fail, and retesting is required, and/or
 - 3. Contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Aggregate shall consist of processed and blended crushed stone. Aggregates shall be free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material and shall be durable and sound. Coarse aggregate shall have a percentage of wear not to exceed 65% after 500 revolutions as determined by ASTM C 131. Aggregate shall meet applicable requirements of Section 305.2 in the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition. Material shall meet the following gradation and other requirements:

Macadam Base Course	
Sieve Size	Percent by Weight Passing
2"	100
1-1/2"	95 - 100
1"	70 - 100
1/2"	48 - 75

# 4	30 - 60
# 30	11 - 30
#200	0 - 12
Liquid Limit	0 to 25
Plasticity Index	0 to 6

Marine Limestone Base Course	
Sieve Size	Percent by Weight Passing
2"	100
1-1/2"	95 - 100
1"	70 - 100
1/2"	50 - 85
# 4	30 - 60
# 30	17 - 38
#200	0 - 20
Liquid Limit	0 to 25
Plasticity Index	0 to 6

- B. Prime Coat: Shall be EA-P Special, Emulsified asphalt, conforming to Section 407 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify subbase has been tested, is dry, and slopes and elevations are correct.
- B. ON SITE OBSERVATIONS OF WORK: The Owner's Representative or Engineer will have the right to require any portion of the work be completed in their presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation at no additional cost to the Owner. However, if the Contractor notifies the Owner such work is scheduled, and the Owner fails to appear within 48-hours, the Contractor may proceed. All work completed, and materials furnished shall be subject to review by the Owner, Engineer or Project Representative. Improper work shall be reconstructed, and all materials, which do not conform to the requirements of the specifications, shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Owner, Project Engineer or Project Representative a minimum of 48-hours' notice for all required observations or tests.

3.2 PREPARATION

- A. Subbase shall be graded and shaped conforming to the lines, grades, and cross sections required and cleaned of all foreign substances prior to constructing base course. Do not place base on soft, muddy or frozen surfaces. Correct

irregularities in subbase slope and elevation by scarifying, reshaping, and recompacting.

- B. At the time of base course construction, subbase shall contain no frozen material.
- C. Surface of subbase shall be checked by the Engineer or Project Representative for adequate compaction and surface tolerances. Ruts or soft yielding spots appearing in areas of subbase course having inadequate compaction, and areas not smooth or which vary in elevation more than 3/8 inch above or below required grade established on the plans, shall be corrected to the satisfaction of the Engineer or Project Representative. Base material shall not be placed until subbase has been properly prepared and test results have so indicated.

3.3 AGGREGATE PLACEMENT

- A. Aggregate shall be placed in accordance with South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition Section 305 and in accordance with all terms included in these specifications.
- B. Level and contour surfaces to elevations and slopes indicated.
- C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.
- F. While at optimum moisture ($\pm 1-1/2\%$), compact base course with rollers capable of obtaining required density. Vibratory, flatwheel, and other rollers accepted by the Engineer may be used to obtain required compaction. Rolling shall continue until base is compacted to 98% of the maximum laboratory dry density as determined by ASTM D 1557. In-place density of the compacted base will be determined in accordance with ASTM D 6938.

3.4 PRIME COAT

- A. Bituminous material for the prime coat shall be applied uniformly and accurately in quantities of not less than 0.15 gallons per square yard nor more than 0.30 gallons per square yard of base course. All irregularities in the base course surface shall be corrected prior to application of prime coat. Clean the base course of all mud, dirt, dust, and caked and loose material
- B. Do not apply prime to a wet surface nor when temperature is below 40°F in the shade. Do not apply prime when rain threatens nor when weather conditions prevent proper construction and curing of prime coat.
- C. The primed base should be adequately cured before the binder or surface course is laid. In general, a minimum of 48 hours should be allowed for complete

curing. Ordinarily, proper surface condition of the prime is indicated by a slight change in the shiny black appearance to a slightly brown color.

3.5 TOLERANCES

- A. Flatness: Maximum variation of ¼-inch measured with an acceptable 10-foot straight edge.
- B. Scheduled Compacted Thickness: Within 3/8-inch.
- C. Variation from Design Elevation: Within 3/8-inch.
- D. Depth measurements for compacted thickness shall be made by test holes through the base course. Where base course is deficient, correct such areas by scarifying, adding base material and recompacting as directed by the Engineer.

3.6 FIELD QUALITY CONTROL

- A. Section 01400 - Quality Assurance: Field inspection.
- B. Density and moisture testing will be performed in accordance with ASTM D 1557 and ASTM D 6938.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.
- D. Frequency of Tests:
 - 1. Base Density and Thickness - One test per 5,000 square feet.

END OF SECTION

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SECTION 02275 - RIP-RAP

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SECTION 02275**RIP-RAP****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Material placed as bank protection and erosion control.

1.2 RELATED SECTIONS

- A. Section 02210 - Soil Erosion Control

1.3 ALLOWABLE TOLERANCES

- A. Depth of rip-rap blanket as shown on the drawings and in these specifications is a minimum depth.

1.4 MEASUREMENT AND PAYMENT

- A. Rip-Rap: Payment will be made at the contract unit price. Payment will include furnishing all labor, materials, and equipment and placing on a prepared surface.

1.5 REFERENCES (LATEST REVISION)

- A. ASTM C 150 – Portland Cement.

PART 2 – PRODUCTS**2.1 MATERIALS**

- A. Stone Rip-Rap: Shall be hard quarry or field stone of such quality the pieces will not disintegrate on exposure to water, sunlight or weather. Stone shall be solid and non-friable and range in weight from a minimum of 25 pounds to a maximum of 150 pounds. At least 50 percent of the stone pieces shall weigh more than 60 pounds. The stone pieces shall have a minimum dimension of 12 inches. Documents indicating stone analysis, source and other pertinent data (i.e. - filter fabric) shall be submitted for review by the Engineer prior to delivery.
- C. Filter Fabric: Shall be a woven fabric of monofilament and multifilament yarn equivalent to Mirafi FW700. Fabric shall be finished so the filaments will retain their relative position with respect to each other. Fabric shall contain stabilizers and/or inhibitors added to make filaments resistant to deterioration due to ultraviolet and/or heat exposure. Fabric shall be free of flaws, rips, holes or defects.

2.2 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products before they are ordered.

PART 3 – EXECUTION

3.1 PREPARATION

- A. The surface to receive rip-rap shall be prepared to a relatively smooth condition free of obstruction, depressions, debris, rises, and soft or low-density pockets of material. Contours and elevations on construction drawings are to the surface of rip-rap material.

3.2 PLACEMENT

- A. Filter fabric shall be placed with the long dimension running up slope. The strips shall be placed to provide a minimum width of one foot of overlap for each joint. Fabric shall be anchored in place with securing pins of the type recommended by fabric manufacturer. Pins shall be placed on or within 3-inches of the over-lap. Place fabric so upstream strip will overlap the downstream strip. Fabric shall be placed loosely to give and avoid stretching and tearing during placement of the stones.
- B. Minimum depth or thickness of stone blanket shall be 12-inches with no under tolerance. Stones shall be dropped no more than three feet during construction. Placing shall begin at bottom of slope. Provide a toe trench if required as detailed on the construction drawings. Entire mass of stone shall be placed to conform with lines, grades, and thickness shown on the plans. Rip-rap shall be placed to its full course thickness at one operation and in such a manner as to avoid displacing the underlying material. Placing of rip-rap in layers, or by dumping into chutes, or by similar methods likely to cause segregation, will not be permitted.

Larger stones shall be well distributed, and the entire mass of stone shall conform to gradation specified. All material used in rip-rap protection shall be placed and distributed so there will be no large accumulations of either the larger or smaller sizes of stone.

It is the intent of these specifications to produce a fairly compact rip-rap protection in which all sizes of material are placed in their proper proportions. Hand placing or rearranging of individual stones by mechanical equipment may be required to secure the results specified.

END OF SECTION

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SECTION 02511 – ASPHALTIC CONCRETE BASE COURSE

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SECTION 02511**ASPHALTIC CONCRETE BASE COURSE****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Asphaltic Concrete Base Course

1.2 RELATED SECTIONS

- A. Section 01025 - Measurement and Payment
- B. Section 01400 - Quality Control
- C. Section 02204 - Earthwork
- D. Section 02512 - Asphaltic Concrete Binder/Surface Courses

1.3 MEASUREMENT AND PAYMENT

- A. Asphaltic Concrete Base Course: Payment will be made at the contract unit price. Payment will include furnishing and placing base, compaction, testing, and all equipment, labor, and materials necessary to complete the work.

1.4 REFERENCES (LATEST REVISION)

- A. ASTM D 946 – Penetration-Graded Asphalt Cement for Use in Pavement Construction.
- B. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.
- C. ASTM D 2726 – Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
- D. ASTM D 2950 – Density of Bituminous Concrete in Place by Nuclear Methods.
- E. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock Used in Engineering Design and Construction.
- F. AASHTO T 245 – Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
- G. AASHTO T 179 – Effect of Heat and Air on Asphalt Materials (Thin-Film Oven Test).
- H. AASHTO M 226 – Viscosity Graded Asphalt Cement.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction.
- B. Mixing Plant: Conform to South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt mixture when ambient air temperature is less than that indicated in the Table nor when the surface is wet or frozen.

Lift Thickness	Min. Air Temperature, Degrees F.
1.0" or Less	55
1.1" to 2.0"	45
2.1" to 3.0"	40
3.1" to 4.5"	35

- B. Place bitumen mixture when mixture temperature is not more than 15 degrees F below bitumen supplier's bill of lading and not more than the maximum specified temperature.

1.7 TESTING

- A. Testing laboratory shall operate in accordance to ASTM D 3740 and E 329 and shall be acceptable to the Engineer.
- B. The testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any tests.
- C. Testing shall be the responsibility of the Contractor and shall be performed at the Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph A above.
- D. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Asphalt Cement: PG64-22 (SC).
- B. Anti-Stripping: Anti-stripping agents or other additives required shall be acceptable to the Engineer prior to their use. Additive delivery systems shall be acceptable to the Engineer.
- C. Aggregate shall consist of processed and blended crushed stone and be free of lumps and balls of clay, organic matter, objectionable coatings and other foreign material, and shall be durable and sound. Material shall meet applicable

requirements of Section 310 of the South Carolina Department of Transportation Standard Specifications.

- D. Base Mixture: Shall meet Section 310 of the South Carolina State Highway Department Standard Specifications.

2.2 SOURCE QUALITY CONTROL AND TESTS

- A. Section 01400 - Quality Control, 01410 - Testing Laboratory Services. Provide mix design for asphalt.
- B. Submit proposed mix design for review prior to beginning of work.
- C. Test samples in accordance with the requirements of these specifications.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify subbase has been tested, is dry, and gradients and elevations are correct.
- B. ON-SITE OBSERVATIONS OF WORK: Owner's Representative or Engineer will have the right to require any portion of work be completed in their presence. If the work is covered up after such instruction, it shall be exposed by the Contractor for observation at no additional cost to Owner. However, if Contractor notifies Owner such work is scheduled, and Owner fails to appear within 48 hours, the Contractor may proceed. All work completed and materials furnished shall be subject to review by the Owner, Engineer, or Project Representative. Improper work shall be reconstructed. All materials, which do not conform to requirements of specifications, shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Owner, Project Engineer or Project Representative a minimum of 48 hours notice for all required observations or tests.

3.2 PREPARATION

- A. Subbase shall be leveled to lines and grades of plans and cleaned of all foreign substances prior to constructing the base course.

Do not place base on soft, muddy, or frozen surfaces.

Correct irregularities in subbase gradient and elevation by scarifying, reshaping, and recompacting.

- B. At the time of base course construction, the subbase shall contain no frozen material.
- C. The surface of subbase shall be checked by Engineer or Project Representative for adequate compaction and surface tolerances. Ruts or soft yielding spots

appearing in areas of the subbase course having inadequate compaction, and areas not smooth or which vary in elevation more than 3/8 inch above or below required grade established on plans shall be corrected to satisfaction of Engineer or Project Representative. Base material shall not be placed until subbase has been properly prepared and test results have so indicated.

3.3 PLACEMENT

- A. Construction shall be in accordance with Sections 310 and 401 of the South Carolina Department of Transportation Standard Specifications.

3.4 TOLERANCES

- A. General: All paving shall be subject to visual and straightedge checking during construction operations and thereafter prior to final acceptance. A 10-foot straightedge shall be maintained in the vicinity of paving operation at all times for measuring surface irregularities on all paving courses. The straightedge and labor for its use shall be provided by Contractor. The surface of all courses shall be checked with a straightedge as necessary to detect surface irregularities. Irregularities such as ripping, tearing or pulling, which in the judgment of Engineer indicate a continuing problem in equipment, mixture or operating technique, will not be permitted to recur. The paving operation shall be stopped until appropriate steps are taken by Contractor to correct problem.
- B. Flatness: Maximum variation of 1/4 inch measured with an acceptable 10 foot straight edge.
- C. Scheduled Compacted Thickness: Within 3/8 inch under tolerance.
- D. Variation from Design Elevation: Within 3/8 inch.
- E. Base Deficient in Thickness: When measurement of any core indicates base is deficient in thickness, additional cores will be drilled 10 feet either side of the deficient core along centerline of lane until cores indicate thickness conforms to above specified requirements. A core indicating thickness deficiencies is considered a failed test. Base deficient in thickness shall be removed and replaced with the appropriate thickness of materials. If Contractor believes cores and measurements taken are not sufficient to indicate fairly the actual thickness of base, additional cores and measurements will be taken, provided Contractor will bear extra cost of drilling cores and filling holes in roadway as directed.

3.5 FIELD QUALITY CONTROL

- A. Section 01400 - Quality Assurance: Field Observation.
- B. Density Testing: Performed in accordance with ASTM D-2726 and ASTM D-2950. Core samples for each day's operation shall be taken, tested and results reported to Engineer the following day. The areas sampled shall be properly restored by Contractor at no additional cost to Owner. Compaction must be accomplished when the temperature of mix is above 185 degrees F and below 300 degrees F. Nuclear gauge tests shall be taken during the asphaltic concrete placement.

1. The pavement core and nuclear gauge densities shall range between 94% and 96% of the theoretical maximum density.

C. Temperature:

1. Asphaltic concrete shall not exceed 325 degrees F at any time.
2. Temperature at time of loading shall be recorded on the truck delivery ticket.

D. Frequency of Tests:

1. Asphaltic Concrete - One test for each 250 tons placed.
 - a. Asphalt extraction and gradation test.
 - b. Core Sample
2. Field determination of density by nuclear method every 5,000 square feet during construction of the base course.

END OF SECTION

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SECTION 02512SC – ASPHALTIC CONCRETE BINDER/SURFACE COURSES

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SECTION 02512SC**ASPHALTIC CONCRETE BINDER/SURFACE COURSES****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Surface Course
- B. Binder Course

1.2 RELATED SECTIONS

- A. Section 01025 – Measurement and Payment
- B. Section 01400 – Quality Control
- C. Section 02204 – Earthwork
- D. Section 02231 – Aggregate Base Course

1.3 MEASUREMENT AND PAYMENT

- A. Asphaltic Concrete Binder Course: Will be paid for at the contract unit price per ton of completed and accepted binder course for the thickness specified.
- B. Asphaltic Concrete Surface Course: Will be paid for at the contract unit price per ton of completed and accepted surface course for the thickness specified.
- C. Tack Coat: No separate payment will be paid for tack coat. Cost will be included in payment for asphalt binder course.
- D. Payment for pavement and tack coat will be in full for preparing and cleaning, providing all materials, labor and equipment including placing, compacting and testing.

1.4 REFERENCES (LATEST REVISION)

- A. ASTM D 946 – Penetration-Graded Asphalt-Cement for Use in Pavement Construction.
- B. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.
- C. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock Used in Engineering Design and Construction.

- D. ASTM D 2726 – Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
- E. ASTM D 2950 – Density of Bituminous Concrete in Place by Nuclear Methods.
- F. ASTM D 1188 – Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.
- G. ASTM D 1754 – Effect of Heat and Air on Asphaltic Materials (Thin-film Oven Test).

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.
- B. Mixing Plant: Conform to South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt mixture when ambient air temperature is less than that indicated in the Table nor when the surface is wet or frozen.

Lift Thickness	Min. Air Temperature, Degrees F.
1" or Less	55
1.1" to 2"	45
2.1" to 3"	40
3.1" to 4.5"	35

- B. Mixture shall be delivered to the spreader at a temperature between 250 degrees F and 325 degrees F.

1.7 GUARANTEE

- A. Contractor shall guarantee the quality of materials, equipment, and workmanship for a period of 12 months after acceptance. Defects discovered during this period shall be repaired by the Contractor at no cost to the Owner.

1.8 TESTING

- A. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- B. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours' notice prior to taking any tests.
- C. Owner shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for

laboratory and all tests shall be by the Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of testing laboratory when:

1. Contractor gives notice the work is ready for inspection and testing, and fails to be ready for the test, and/or
 2. Testing of the Contractor's work, products or materials fail, and retesting is required, and/or
 3. Contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work.
- D. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 TACK COAT

- A. Shall consist of asphalt binder (asphalt cement) or emulsified asphalt, conforming to Section 401 of the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction. Asphalt binder shall be PG64-22. The acceptable grades of emulsified asphalt are RS-1, MS-1, MS-2, HFMS-1, HFMS-2, SS-1, CRS-1, CRS-2, CMS-2, and CSS-1.

2.2 ASPHALT BINDER AND ADDITIVES

- A. Shall be PG64-22 and conform to Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.
- B. Anti-Stripping: Shall conform to requirements of Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.

2.3 AGGREGATES

- A. General: Mineral aggregate shall be composed of fine aggregate or a combination of fine and coarse aggregate. Coarse aggregate shall be that portion of the material retained on a No. 4 sieve.

Fine aggregate shall be considered that portion passing the No. 4 sieve. Fine aggregate, coarse aggregate, and any additives in combination with the specified percentage of asphalt cement shall meet the requirements of tests specified, before acceptance may be given for their individual use. Marine (Fossiliferous) limestone shall not be used.

- B. Fine Aggregate: Shall conform to the requirements of Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.
- C. Coarse Aggregate: Shall be granite stone and conform to the requirements of Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.
- D. Surface Course: The surface course shall consist of fine and coarse aggregate and mineral filler uniformly mixed with hot asphalt binder in an acceptable mixing plant. The plant shall conform to South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition. The gradations, asphalt content and air voids shall be the following:

TYPE B	
Square Sieve	% Passing
3/4 inch	100
1/2 inch	95 – 100
3/8 inch	76 – 100
No. 4	52 – 75
No. 8	36 – 56
No. 30	16 – 36
No. 100	5 – 18
No. 200	2 – 8
% Asphalt Binder	4.8 – 6.0
Air Voids, %	3 – 4

- E. Intermediate or Binder Course: The mineral aggregates and asphalt binder shall be combined in such proportions the composition by weight of the finished mixture shall be within the following range limits:

TYPE B	
Sieve Designation	Percentage by Weight Passing
1 Inch	100
3/4 inch	98 – 100
1/2 inch	90 – 100
3/8 inch	72 – 90
No. 4	44 – 62
No. 8	23 – 43
No. 30	10 – 25
No. 100	4 – 12
No. 200	2 – 8
% Asphalt Binder	4.5 – 6
Air Voids, %	3.2 – 4

2.4 SOURCE QUALITY CONTROL AND TESTS

- A. Section 01400 – Quality Control and Section 01410 - Testing Laboratory Services.
- B. Submit proposed mix design for review prior to beginning of work.
- C. Test samples in accordance with the requirements of these specifications.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. On-Site Observations: Owner's Representative or Engineer will have the right to require any portion of work be completed in their presence. If work is covered up after such instruction, it shall be exposed by the Contractor for observation at no additional cost to Owner. However, if Contractor notifies Engineer such work is scheduled, and Engineer fails to appear within 48 hours, the Contractor may proceed. All work completed, and materials furnished shall be subject to review by the Engineer or Project Representative. Improper work shall be reconstructed. All materials, which do not conform to requirements of specifications, shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Owner, Project Engineer or Project Representative a minimum of 48-hours' notice for all required observations or tests.

- B. Contractor shall verify base has been tested, is dry, and slopes and elevations are correct.

3.2 PREPARATION

- A. Apply tack coat in accordance with Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition. Rate of application shall be 0.05 to 0.15 gallons per square yard of surface.
- B. Work shall be planned so no more tack coat than is necessary for the day's operation is placed on the surface. All traffic not essential to the work should be kept off the tack coat.
- C. Apply tack coat to contact surfaces of curbs and gutters. Apply in manner so exposed curb or gutter surfaces are not stained.
- D. Coat surfaces of manhole frames and inlet frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.3 PLACEMENT

- A. Construction shall be in accordance with Sections 401, 402, and 403 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.
- B. Asphaltic concrete shall not be placed on a wet or frozen surface.
- C. Compaction shall commence as soon as possible after the mixture has been spread to the desired thickness. Compaction shall be continuous and uniform over the entire surface. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks. Compaction rolling shall be complete before material temperature drops below 175° F.
- D. Areas of pavement with deficient thickness or density shall be removed and replaced at no additional cost to the Owner.

3.4 TOLERANCES

- A. General: All paving shall be subject to visual and straightedge evaluation during construction operations and thereafter prior to final acceptance. A 10-foot straightedge shall be maintained in the vicinity of the paving operation at all times for the purpose of measuring surface irregularities on all paving courses. The straightedge and labor for its use shall be provided by the Contractor. The surface of all courses shall be checked with the straightedge as necessary to detect surface irregularities. Irregularities such as rippling, tearing or pulling, which in the judgment of the Engineer indicate a continuing problem in equipment, mixture or operating technique, will not be permitted to recur. The paving operation shall be stopped until appropriate steps are taken by the Contractor to correct the problem.
- B. Flatness: All irregularities in excess of 1/8-inch in 10-feet for surface courses and 1/4-inch in 10-feet for intermediate courses shall be corrected.
- C. Variation from Design Elevation:
 - 1. General Paving: Less than 1/4-inch.
 - 2. Accessible Routes: Shall not exceed 1/4-inch. However, accessible routes shall not exceed maximum ADA allowable slopes. Contractor shall remove and replace any and all portions of the accessible route that exceed maximum ADA allowable slopes.
- D. Scheduled Compacted Thickness: Within 1/4-inch per lift.
- E. Pavement Deficient in Thickness: When measurement of any core indicates the pavement is deficient in thickness, additional cores will be drilled 10-feet either side of the deficient core along the centerline of the lane until the cores indicate the thickness conforms to the above

specified requirements. A core indicating thickness deficiencies is considered a failed test. Pavement deficient in thickness shall be removed and replaced with the appropriate thickness of materials. If the Contractor believes the cores and measurements taken are not sufficient to indicate fairly the actual thickness of the pavement, additional cores and measurements will be taken, provided the Contractor will bear the extra cost of drilling the cores and filling the holes in the roadway as directed.

3.5 FIELD QUALITY CONTROL

- A. Acceptance of the in-place density of the binder and surface courses shall be in accordance with the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.
- B. Density Testing: Performed in accordance with ASTM D-2726 and ASTM D-2950. Core samples for each day's operation shall be taken, tested and results reported to the Engineer the following day. The areas sampled shall be properly restored by the Contractor at no additional cost to the Owner. Nuclear gauge tests shall be taken during the asphaltic concrete placement.
 - 1. The pavement core and nuclear gauge densities shall range between 94% and 96% of the theoretical maximum density.
- C. Temperature:
 - 1. Asphaltic concrete shall not exceed 325 degrees F at any time.
 - 2. Asphaltic concrete shall not be placed once the temperature of the mix falls below 250 degrees F or the delivered temperature is more than 15 degrees F below the batch plant's delivery ticket.
 - 3. Temperature at time of loading shall be recorded on the truck delivery ticket.
- D. Frequency of Tests:
 - 1. Asphaltic Concrete – One test for each 250 tons placed.
 - a. Asphalt extraction and gradation test.
 - b. Core Sample
 - 2. Field determination of density by nuclear method every 5,000 square feet during construction of the asphaltic concrete binder/surface course.

END OF SECTION

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SECTION 02570
TRAFFIC CONTROL

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section covers furnishing, installation, and maintenance of all traffic control devices, portable signal equipment, warning signs, and temporary traffic lanes used during construction of the project.

1.2 RELATED WORK

- A. Section 02580 – Thermoplastic Pavement Markings

1.3 RESPONSIBILITY

- A. The Contractor shall furnish, install, and maintain all necessary automated signals, barricades, concrete traffic barriers, warning signs, traffic barriers, traffic lanes, and other protective devices. Ownership of these temporary warning devices shall remain with the Contractor provided devices are removed promptly after completion and acceptance of work to which devices pertain. If such warning devices are left in place for more than 30 days after specified time for removal, Owner shall have the right to remove such devices and to claim possession thereof.

1.4 MEASUREMENT AND PAYMENT

- A. Payment will be included in the contract unit prices. Payment will include all equipment, labor, and materials necessary to complete the work.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. All barricades signs, and traffic control signal devices shall conform to requirements of the current South Carolin Manual on Uniform Traffic Control Devices except as may be modified in these project specifications.
- B. Portable traffic control signal devices, barricades, signs and other Control Devices shall be either new or in acceptable condition when first erected on Project and shall remain in acceptable condition throughout the construction period.
- B. All signs shall have a black legend and border on an orange reflectorized background and will be a minimum of engineering grade reflective.

PART 3 – EXECUTION

3.1 ERECTION

- A. Prior to commencement of any actual construction on the project, Contractor shall erect appropriate advance warning signs and place concrete traffic barriers where necessary. Subsequently, as construction progresses and shifts from one side of road to the other, temporary lanes must be installed to provide continuous two way traffic and bike thoroughfare. All appropriate signs and traffic control devices pertinent to the work shall be erected ahead of construction site to advise and warn travelling public of activity and any necessary detours.

3.2 DELAYS TO TRAFFIC

- A. Except in rare and unusual circumstances, two-way traffic shall be maintained at all times by temporary and/or permanent roads. There are to be no traffic delays during the hours between 7 AM – 10 AM and 4 PM – 10 PM. Between the hours of 10 AM and 4 PM the maximum delay is to be 15-minutes.
- B. When traffic is halted temporarily due to transition procedures including the ingress and egress of construction vehicles, Contractor shall provide necessary flagging personnel with proper equipment and clothing to hold such traffic.
- C. If Contractor's proposed traffic control plan involves more than occasional disruption to alternating one way traffic through the work, then temporary, signalized control equipment will be required.

3.3 TEMPORARY TRAFFIC LANES

- A. Two-lane traffic shall be maintained at all times unless prior written permission has been given and all necessary flagging personnel and/or signage has been installed. Temporary lane line stripes shall be applied to the detour paving, as agreed to by Engineer and Owner's representative. The no-passing double center-line stripes shall be yellow. Such stripes shall be a temporary, degradable, reflectorized tape strip. All temporary striping shall be maintained throughout the period traffic control is needed.
- B. Contractor is responsible for installation and removal of all temporary roads and trails throughout the construction process. These detour roads are to be in accordance with the Pavement Specifications herein.

3.4 SIGNS AND BARRICADES

- A. Contractor shall provide a detailed map showing location and verbage of all traffic control signs and methods for the project. All critical warning signs for the project will be a minimum of engineering grade reflective material and include appropriate flashing lights.
- B. Appropriate Safety Barricades shall be installed between bicycle trails, sidewalks, and the temporary traffic lanes. These barricades shall be impact resistant for passenger vehicles with a travelling speed of 40 mph.

1. Advance warning signs: These signs shall be placed approximately 500 feet in advance of the construction site and detour on each approach to the construction area with subsequent warning signs every 250 feet, until construction site is met.
2. Road Construction Signs: Before and during construction of the detour, advance road construction signs shall be located as already stated above. The construction site detour lanes will have reflective trestle type barricade with flashing lights spaced a maximum of 25 feet apart to delineate each side of any temporary roadway. Additional signage shall be placed to indicate a reduced speed limit of 10 mph for the entire construction area. Other signs as appropriate to a particular activity in the work area shall be erected in advance of that activity.
3. Barricades: While detour is open to traffic, a line of concrete traffic barricades shall be placed across the closed roadway to channelize traffic onto detour. They shall be spaced across the blocked roadway end to end so no vehicle will be able to pass between any two adjacent barricades.
4. Barriers: Shall be wooden having a minimum of 3 horizontal 6 inch rails spaced 20 inches on center. Markings for barrier rails shall be 6 inches wide alternate orange and white reflectorized stripes sloping downward at 45 degrees in the direction traffic is to pass.

During hours of darkness, the Contractor shall place and maintain flashing warning lights on tops of all barriers.

5. Direction Arrow Signs: At each change in traffic direction along the detour, Contractor shall install a sign with an arrow indicating change in traffic direction. This sign is to be located across the pavement from and facing on-coming traffic.
6. End Construction Sign: This sign shall be 60 inches x 24 inches and erected approximately 200 feet beyond end of construction area on the right-hand side.

END OF SECTION

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EXTRUDED OR HOT SPRAY APPLICATION

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SECTION 02580**THERMOPLASTIC PAVEMENT MARKINGS
EXTRUDED OR HOT SPRAY APPLICATION****PART 1 – GENERAL****1.1 DESCRIPTION:**

- A. Work shall consist of furnishing and applying thermoplastic reflectorized pavement marking materials on surface of pavements to provide pavement markings of a color (white or yellow) and pattern as indicated on the construction drawings. Contractor shall supply all necessary equipment and materials for the installation of traffic markings.

1.2 WARRANTY:

- A. Contractor shall transfer warranty to the Owner on thermoplastic materials issued by manufacturer. Contractor shall also furnish the Owner a 12-month warranty for application. These warranties shall specify guaranteed retainage of material for a stated period beginning with the application date. Work will not be allowed to commence until warranties have been received by the Owner.

1.3 MEASUREMENT AND PAYMENT:

- A. No measurement will be made for this project.

Payment will be included in the contract unit prices. Payment will include supplying of materials at the rate specified, preparation of pavement surface, application of all materials, protection of markings, protection of traffic, and all work involved to provide pavement markings in place, complete in accordance with these specifications and special provisions, including labor, equipment, and incidentals necessary to satisfactorily complete the work specified.

PART 2 – PRODUCTS**2.1 MATERIALS:**

- A. Pavement marking material shall be a reflectorized mixture of thermoplastic binder and reflectorized glass beads. Additional glass beads are applied by dropping immediately after marking material is applied to surface of the pavement. Prior to application of the pavement marking material, surface of all pavements shall be coated with a primer-sealer material if recommended by thermoplastic manufacturer.
- B. Thermoplastic Compound: The hydrocarbon type thermoplastic compound shall meet all requirements of AASHTO M 249. Except material may be shipped in the granulated form.
- C. Glass Beads – (Drop-on): The drop-on glass beads shall meet requirements of AASHTO M 247 – Type 1.

- D. Primer-Sealer – A primer-sealer as recommended by the manufacturer of thermoplastic pavement marking material shall be utilized on all portland cement pavement surfaces and all bridge surfaces which have not been overlaid with asphalt. Primer-sealer also shall be utilized on any type of pavement prior to the placing of Railroad Crossing Symbols. Primer-sealer shall be used on asphaltic concrete pavement surfaces if recommended by the manufacturer of thermoplastic pavement marking material. Primer-sealer shall form a continuous film which will mechanically adhere to pavement and shall not discolor nor cause any noticeable change in appearance of the pavement outside of finished pavement marking.
- E. Contractor shall obtain from manufacturer of the thermoplastic binder, tests results required by AASHTO M 249 for each batch of material furnished along with a final certification stating materials furnished met requirements of contract specifications. Contractor shall obtain from manufacturer of drop-on glass beads a certification stating material furnished met requirements of contract specifications. Copies of above described affidavits shall be furnished to the Owner.

PART 3 – EXECUTION

3.1 APPLICATION PROPERTIES OF AASHTO M 249 IS EXPANDED AS FOLLOWS:

- A. Equipment – Material shall be prepared by only means of an insulated batching machine recommended or furnished by manufacturer of compound and shall consist of a special kettle for melting and heating the composition. Applicators may be either a truck mounted liner or a portable unit. "Truck mounted" shall be defined as a self-propelled vehicle with six or more wheels and an enclosed cab for housing the driver.

If contract requires extruded application, material shall be applied to the pavement by an extrusion method wherein one side of the shaping die is the pavement and the other three sides are contained by, or are part of suitable equipment for heating and controlling the flow of the material.

The batching machine shall be constructed to provide continuous mixing and agitation of material. Conveying part of equipment between the main material reservoir and final dispensing nozzle/shaping die shall be constructed to prevent accumulation and clogging. All parts of equipment which come in contact with the material shall be constructed to be easily accessible and exposable for cleaning and maintaining.

Equipment shall be constructed so all mixing and conveying parts to final dispensing nozzle/shaping die maintain material at the plastic temperature.

Equipment shall be constructed to assure continuous uniformity in dimensions of the markings.

Controls shall be set up so the operator can override set automatic cycles in order to extend a line or to begin a new cycle at any selected point.

Applicators shall provide a means for cleanly cutting off square stripe ends. Truck mounted liner shall provide a method of automatically applying "skip" or solid longitudinal lines, including right and left edge lines, of any combination of single or double line configurations (color and pattern) with machine traveling in the direction of normal traffic flow. The use of pans, aprons, or similar appliance which the nozzle/die overruns will not be permitted.

Beads shall be applied to surface of completed stripe by an automatic bead dispenser attached to the applicator. Beads are dispensed almost instantly upon the completed line.

Applicators shall be constructed to produce varying widths of traffic markings as indicated on construction drawings.

Heating of kettles and melters shall be by controlled heat transfer systems which are oil jacketed or indirect flame air jacketed. Directed flame equipment will not be allowed. All kettles and melters must be equipped with an automatic thermostatic control device and proper thermometers to control temperature of the material at manufacturer's recommended application temperature range.

Applicator and kettle must be so equipped and arranged as to satisfy requirements of the National Fire Underwriters, and all state and local requirements.

Applicators shall be mobile and maneuverable so straight lines can be followed and normal curves can be made.

B. Construction Requirements – Traffic shall not be permitted through the project during construction.

1. Preparation of Surface – The pavement shall be dry and free of glaze, oil, dirt, grease or other foreign contaminants. Where directed by Engineer, Contractor shall buff or sand blast pavement surface for a width equal to two inches wider than the stripe to be applied in order to secure a proper surface for adequate bonding of thermoplastic material.
2. Application of Primer-Sealer – Where used, primer-sealer shall be sprayed on the pavement surface where the lines are to be applied. Thickness of application and time on the pavement prior to thermoplastic application shall be governed by recommendations of primer-sealer manufacturer.
3. Application of Marking Material – All longitudinal markings shall be placed with a truck-mounted applicator except where the length of a particular marking is too short, or curvature too great, to permit efficient use of the liner. Transverse markings may be applied with a portable unit.

The markings shall be straight or of uniform curvature and shall conform uniformly with tangents, curves and transitions. Symbols shall be of dimensions shown on the plans. Markings must be of dimensions and placed as shown on the plans. The contractor shall provide sufficient control points to serve as guides for application of markings.

Finished line markings shall be free from waviness and the lateral deviation shall not exceed two (2) inches in fifteen (15) feet. Any greater deviation shall be sufficient cause for requiring the Contractor to remove and correct such markings at their own expense. Contractor shall also be required to remove and correct any symbol markings not meeting dimensional requirement shown on the plans.

Contractor shall protect the markings until dry by placing guarding or warning devices as necessary. In the event any vehicle should cross a wet marking, such marking shall be reapplied and lines made by moving vehicle removed by Contractor.

To avoid poor quality marks, markings are to be placed only when surface of pavement is dry as determined by visual inspection, when the relative humidity as reported by local weather authorities is 90% or less, and when the pavement surface temperature, as determined by means of surface thermometers, is 55 degrees F or above. Contractor shall provide appropriate surface thermometers, certified to be correct, to measure pavement temperatures during the work.

No markings shall be applied between October 15 and March 1 inclusive, except by permission of the Engineer.

Sufficient personnel experienced in handling and application of this type of material shall be provided by Contractor to assure work is completed properly.

Work shall be completed only during daylight hours, and all markings shall be sufficiently dry, before sunset, to permit crossing by traffic. All protective devices shall be removed before sunset to allow free movement of traffic at night.

Marking material shall be applied at a temperature providing best adhesion to the pavement and shall be between 380 degrees F and 420 degrees F or as recommended by the manufacturer. The material shall be heated uniformly throughout and shall have uniform disbursement of binder, pigment, and glass beads when applied to surface of the pavement.

All extruded lines 12 inches or less shall be applied with a die equal to the width of the line. All lines greater than 12 inches may be applied with two dies, the total widths of which equal the width of the line.

4. Rate of Application

- a. Marking material shall be applied at the specified widths and at a rate to result in a new material thickness at center of line as specified below.

5. Type of Marking
- a. Edge lines and median lines (5" solid white, 5" solid yellow and 5" broken yellow). 90 mils

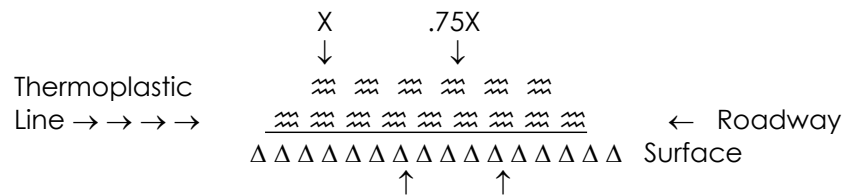
Lane lines (5" broken white) 90 mils

Center lines on two – lane roadways (5" broken yellow and 5" solid yellow) 90 mils

- b. All others 125 mils

The diagram below refers to applications of all thicknesses.

The edge of the line shall be not thinner than 75% of the center thickness.



NO SCALE

- c. Glass Beads – “Drop-on” glass beads shall be mechanically applied to surface of marking material immediately after material is applied to the pavement surface, and while marking material is still molten so beads will be held by and mechanically embedded in surface of material. Beads shall be uniformly distributed over the minimum rate of 12 pounds per 100 square feet of stripe. Drop-on beads shall be applied mechanically.

3.2 OBSERVATION AND ACCEPTANCE OF WORK:

- A. All thermoplastic markings shall be checked both day and night to determine whether the intent of these specifications has been achieved. Any markings failing to have satisfactory appearance, either day or night, shall be reapplied at Contractor's expense.

Final acceptance of thermoplastic pavement markings will be delayed for a period of 30 days after completion to permit observation of performance. Contractor shall be required to replace any markings or markers that, in the opinion of Owner, have not performed satisfactorily during this 30-day period due to defective materials and workmanship in manufacture and application.

Application of Pavement Markings and Non-recessed Pavement Markers – When pavement markings (centerline, lane lines, and edge lines) and non-recessed pavement markers are applied on a roadway opened to traffic and in a continuous operation of moving vehicles and equipment, the following minimum warning devices shall be required.

1. The vehicle applying the pavement markings shall have sequential or flashing arrows as directed by Engineer.
2. A shadow vehicle shall maintain at least a distance of 50' behind the vehicle applying pavement markings and shall have an acceptable sequential or flashing arrow board.

Application of pavement markings shall be accomplished without stopping traffic except when directed by the Owner. If Owner allows temporary closing of any part of the traveled width of any pavement, either on main roadway or intersecting roads and drives, and thereby restrict traffic, Contractor shall provide all barricades, lights, flagmen and such other protection to traffic as may be necessary for protection of work and safety of public.

Contractor shall at all times set up and operate equipment to encroach as little as possible upon the traveled width of any pavement opened to traffic.

Contractor shall submit a traffic control plan for application of thermoplastics. The plan will have to be reviewed and accepted by Owner before work begins.

END OF SECTION.

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SECTION 02667SC
WATER DISTRIBUTION SYSTEM

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Piping
- B. Valves
- C. Fittings
- D. Connect to Existing System
- E. All necessary appurtenances to convey potable water from the existing system to the location shown on the plans.

1.2 RELATED SECTIONS

- A. Section 02110 – Site Clearing
- B. Section 02204 – Earthwork
- C. Section 02902 – Grassing

1.3 OPTIONS

- A. The bid form and specifications describe several pipe materials. Owner will select the one to be used. Where manufacturers of material or equipment are named in the specifications, Contractor may use equipment or materials of other manufacturers provided they are reviewed and accepted by Engineer as meeting specifications prior to ordering such equipment or materials.

1.4 REFERENCES (Latest Revision)

- A. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.
- C. ANSI/AWWA C 153/A-21.53 – Ductile Iron Compact Fittings for Water Service.
- D. ANSI/AWWA C 110/A21.10 – Ductile Iron and Gray Iron Fittings,
- E. ANSI/AWWA C 150/A-21.50 – Thickness Design of Ductile Iron Pipe.
- F. ANSI/AWWA C 151/A-21.51 – Ductile Iron Pipe, Centrifugally Cast, for Water, or other liquids.

- G. ANSI/AWWA C 104/A-21.4 – Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
- H. ASTM D 1784 – Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- I. ASTM D 2241 – Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR - Series).
- J. ANSI/AWWA C 901 – Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inch through 3-inches for Water Service.
- K. ASTM D 2737 – Polyethylene (PE) Plastic Tubing.
- L. ANSI/AWWA C 115/A21.15 – Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges.
- M. ANSI/AWWA C 111/A21.11 – Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
- N. ASTM D 3139 – Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- O. ANSI/AWWA C 900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 inches through 12 inches, for Water Transmission and Distribution.
- P. ANSI/AWWA C 500 – Metal-Seated Gate Valves for Water Supply Service.
- Q. ANSI/AWWA C 509 – Resilient-Seated Gate Valves for Water Supply Service.
- R. ANSI/AWWA C 502 – Dry-Barrel Fire Hydrants.
- S. ANSI/AWWA C 800 – Underground Service Line Valves and Fittings.
- T. ANSI/AWWA C 600 – Installation of Ductile Iron Water Mains and Their Appurtenances.
- U. ANSI/AWWA C 605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
- V. ASTM D 2774 – Underground Installation of Thermoplastic Pressure Piping.
- W. ASTM D 6938 – In-Place Density and Water Content of Soil and Soil-Aggregate By Nuclear Methods (Shallow Depth).
- X. ANSI/AWWA C 651 – Disinfecting Water Mains.
- Y. ASTM D 1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort.
- Z. ANSI/AWWA C 504 – Rubber-Seated Butterfly Valves.
- AA. ANSI B-18.2.2 – Square and Hex Bolts and Screws.

- BB. ANSI B-18.2.2 – Square and Hex Nuts.
- CC. ANSI/NSF Standard 61.
- DD. ANSI/AWWA C200 – Steel Water Pipe – 6 inch (150 mm) and Larger.
- EE. ASTM A 53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- FF. ANSI/AWWA C905 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14-inch through 48-inch (350 mm through 1,200 mm), for Water Transmission and Distribution.
- GG. ANSI/AWWA C 512 – Air Release, Air/Vacuum, and Combination Valves for Waterworks Service.
- HH. ANSI/AWWA C 515 – Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
- II. ASTM A 139 – Electric-Fusion (Arc) – Welded Steel Pipe (NPS4 and Over).

1.5 QUALITY ASSURANCE

- A. Materials – Contractor will furnish the Engineer and Owner a description of all material before ordering. Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Manufacturer – Material and equipment shall be standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on quality and performance of the products.
- C. Subcontractor – A subcontractor for any part of the work must have experience on similar work, and if required, furnish Engineer with a list of projects and Owners or Engineers who are familiar with its competence.
- D. Design – If Contractor wishes to furnish devices, equipment, structures, and systems not designed by Engineer, these items shall be designed by either a Professional Engineer registered in the state of this project, or by someone Engineer accepts as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.
- E. Testing Agencies – Soil testing shall be conducted by a testing laboratory which operates in accordance with ASTM D 3740 and E 329 latest revision and be acceptable to the Engineer prior to engagement. Mill certificates of tests on materials made by manufacturers will be accepted provided manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with name of entity making the test.
- F. Hydrostatic tests on pipe shall be made by Contractor with equipment qualified by the Engineer. The Engineer or Project Representative reserves the right to

accept or reject testing equipment. Hydrostatic testing shall be conducted in the presence of Engineer or Project Representative and a representative of Water Supplier.

- G. All pipe, fittings, packing, jointing materials, valves, and fire hydrants shall conform to Section C of the American Water Works Association (AWWA) Standards.
- H. All materials and products which contact potable water must be third party certified as meeting the specifications of ANSI/NSF Standard 61.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

- A. Water mains shall be sterilized to meet requirements of the appropriate Health Department. Sterilization shall be in accordance with AWWA Standards C-651, latest revision.
- B. Fire line sprinkler systems and dedicated fire lines shall be protected by an acceptable double check valve assembly. Water lines in high hazard categories shall be protected by an acceptable Reduced Pressure Zone (RPZ) Backflow Preventer.
- C. Any pipe, solder, or flux which is used in the installation or repair of any public water system or in any plumbing in a residential or nonresidential facility which provides water, through connection to a public water system, for human consumption shall be lead free. Lead free is defined as not more than 0.2% lead with respect to solder and flux and not more than 8.0% lead with respect to pipes and pipe fittings. Leaded joints necessary for repair of cast iron pipes shall be exempt from the lead free requirement.
- D. No water pipe shall pass through or come in contact with any part of a sewer manhole. Water lines may come in contact with storm sewers or catch basins if there is no practical alternative, provided ductile iron is used, no joints of water line are within the storm sewer or catch basin, and joints are located as far as possible from storm sewer or catch basin.
- E. Potable water lines shall not be laid less than 25 feet horizontally from any portion of a wastewater tile field or spray field, or shall be otherwise protected by a method acceptable to DHEC.
- F. Where the minimum cover of 30 inches cannot be provided, pipe shall be steel, concrete, ductile iron, or other material and method acceptable to DHEC, and, when necessary, insulated to prevent freezing.
- G. Air relief valves shall be provided in accordance with sound engineering practices at high points in water mains as required. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur.
- H. The open end of an air relief pipe from automatic valves or from a manually operated valve shall be extended to the top of pit and provided with a screened downward facing elbow.

- I. Chambers, pits, or manholes containing valves, blow-off, meters, air release valves, or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer.
- J. There shall be no connection between distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminated materials may be discharged or drawn into the system.
- K. Asbestos cement pipe shall not be used in potable water system except in the repair of existing asbestos cement lines.
- L. Thermoplastic pipe shall not be used above grade.
- M. Steel pipe shall not be allowed in water systems unless specified as in AWWA C200 or ASTM A53.
- N. Water mains shall be installed out of contaminated areas, unless using piping materials protecting the system (i.e., Ductile Iron Pipe with chemical resistant gaskets). Route lines out of contaminated areas if possible.
- O. Cross Connection Control (Backflow Prevention Devices):
 - 1. There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminated materials may be discharged or drawn into the system.
 - 2. No-by-passes shall be allowed, unless the bypass is also equipped with an acceptable backflow prevention device.
 - 3. Reduced pressure principal backflow prevention assemblies shall not be installed in any area location subject to possible flooding. This includes pits or vaults not provided with a gravity drain to the ground's surface capable of exceeding discharge rate of relief valve. Generally, if installed in a pit, drain line shall be 2 times the size of line entering backflow prevention device. The drain cannot empty into any type of ditch, storm drain, or sewer, which could flood water back into pit.
 - 4. All piping up to inlet of the backflow prevention device must be suitable for potable water. The pipe must be AWWA or NSF approved. Black steel pipe cannot be used on inlet side of the device.

1.7 PRODUCT DELIVERY, STORAGE & HANDLING

- A. Material shall be unloaded in a manner avoiding damage and shall be stored where it will be protected and will not be hazardous to traffic. The Contractor shall repair any damage caused by the storage. Material shall be examined before installation and neither damaged nor deteriorated material shall be used in the work.

1.8 SEQUENCING AND SCHEDULING

- A. Contractor shall arrange work so sections of mains between valves are tested, sterilized, pavement replaced, and the section placed in service as soon as reasonable after installation.

1.9 ALTERNATIVES

- A. The intention of these specifications is to produce the best system for the Owner. If Contractor suggests alternative material, equipment or procedures will improve the results at no additional cost, Engineer and Owner will examine suggestion, and if it is accepted, it may be used. The basis upon which acceptance of an alternative will be given is its value to the Owner, and not for Contractor's convenience.

1.10 GUARANTEE

- A. Contractor shall guarantee the quality of materials, equipment, and workmanship for a period of 12 months after acceptance. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

1.11 EXISTING UTILITIES

- A. All known utility facilities are shown schematically on plans, and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown on plans will not relieve the Contractor of responsibility under this requirement. "Existing Utilities Facilities" means any utility existing on the project in its original, relocated, or newly installed position. Contractor will be held responsible for the cost of repairs to damaged underground facilities; even when such facilities are not shown on plans
- B. The Contractor shall call for underground utility locations before starting work. Underground utilities location service can be contacted at 811 or 1-888-721-7877.

1.12 CONNECT NEW MAIN TO EXISTING SYSTEM

- A. Contractor shall furnish necessary pipe and perform all excavation, dewatering, shoring, backfilling, etc., necessary to make the connection of a new main to existing water system. Contractor shall contact the Superintendent of Water Utility a minimum of 48 hours in advance of construction. Contractor shall be responsible for coordinating construction with the utility operator.

1.13 DAMAGE TO EXISTING WATER SYSTEM

- A. Damage to any part of the existing water system by Contractor or Subcontractors, repaired by Utility Owner's forces, shall be charged to Contractor on basis of time and material, plus 30% for overhead and administration.

1.14 MEASUREMENT AND PAYMENT

- A. Measurement – The length of mains, and branch lines to be paid for will be determined by measurement along the centerline of the various sizes and types

of pipe actually furnished and installed, from the center of fitting, and from the center of the main to the end of the branch connection. No deduction will be made for the space occupied by valves and fittings.

B. Payment -

1. Pipe – Payment will be made at the contract unit price per linear foot for the various types and sizes of pipe that are actually placed, as shown on the plans, or as directed by the Engineer. Excavation, installation, backfill, compaction, testing, metal detector tape, tracing wire, and all other incidentals to installation of the mains shall be considered as subsidiary obligations of the Contractor for the completion of the line in place.
2. Fittings – Fittings for iron and plastic pipe in the distribution system will be paid for on the basis of the unit price per pound of ductile iron fittings at the weights listed in AWWA Specification C-153 for mechanical joint compact fittings. (Excluding Accessories.) No distinction will be made between the weight of compact ductile iron, cast iron or ductile iron fittings, unless the fittings used are not manufactured as compact fittings. Fittings not manufactured as compact fittings will be paid for on the basis of the unit price per pound of ductile iron fittings at the weights listed in AWWA C-110. P.V.C. fittings used for P.V.C. pipe, at the Contractor's option, will be considered a subsidiary obligation to the pipe and will not be measured for separate payment. Payment for P.V.C. fittings shall be included in the unit price per foot for P.V.C. The adapters necessary to connect to valves shall be considered a part of the line in which they are installed.
3. Valves – Payment will be made at the contract unit price for each size. Payment will include furnishing and installing the valve, valve boxes, extensions, or manholes.
4. Fire Hydrants – Payment will be made at the contract unit price. Payment will include the cost of furnishing, installing, and connecting the hydrant, gravel sump, restrained joints, and backfilling. The 6 inch pipe from the main line to the hydrant will be paid for as 6 inch pipe. Gate valve and valve box will be paid for separately.
5. Cleaning and Disinfecting – No separate payment will be made for cleaning and disinfecting. Cleaning and disinfecting piping in the distribution system will be included in the lump sum and unit prices for the appropriate items.
6. House Service Connections – Payment will be made at the contract unit price. Payment will include the cost of furnishing and installing the tapping saddle, corporation stop, curb stop and marking stake at the property line. The service pipe will be paid for at the contract unit price for each size specified.
7. Grassing – There will be no separate measurement or payment. Grassing shall be considered as a subsidiary obligation of the Contractor in the restoration of disturbed areas.

8. Metal Detector Tape – No separate payment will be made for tape. The cost of furnishing and placing metal detector tape shall be included in the contract unit price for installing pipe.
9. Connections to Existing Mains – Payment will be made at the contract unit price for each type connection and will include all equipment, labor, and materials required to locate, excavate, cut, connect, backfill, and compact.
10. Tapping Sleeves and Crosses – Payment will be made at the contract unit price. Payment will include all labor, materials, and equipment necessary to locate, excavate, furnish, and install the sleeve or cross, valve, valve boxes or manholes, tap the existing main, backfilling and compaction.
11. Remove and Replace Existing Pavement – Payment will be made on a square yard basis, and constructed in accordance with the detail shown.
12. Flush Valves – Payment will be made at the contract unit price. Payment will include furnishing and installing the ball valve, riser pipe and cap, valve or meter box, and the concrete collar.
13. Tracing Wire – No separate payment will be made for wire. The cost of furnishing and placing location wire shall be included in the contract unit price for installing pipe.
14. Restrained Joints – Payment will be made at the contract unit price for each size installed. Payment will include all labor, materials, and equipment necessary to furnish and install each restrained joint.
15. Air Release Valve in Manhole – Payment will be made at the contract unit price for each size. Payment will include furnishing and installing the air release valve, saddle, ball valve, manhole, frame, and cover.
16. Backflow Preventer Assembly – Payment will be made at the contract unit price for each size. Payment will include furnishing and installing the backflow preventer assembly, vault, cover, testing, and certification.
17. Casing – Payment will be made at the contract unit price per linear foot. Payment will include dewatering, excavation, providing steel pipe, installation, casing spacers, enclosure method, backfilling, compaction, testing, and all equipment, labor, and materials necessary to complete the work.

1.15 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).
- B. In place density tests in accordance with ASTM D 6938.

- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. The testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any of the tests.
- E. Testing Laboratory shall be selected by, engaged by and be the responsibility of the Owner. Testing Laboratory shall be responsible to the Owner and the Owner's Engineer. Payment for laboratory and all tests shall be by the Owner, except the Owner specifically reserves the right to deduct from the contractor's payment, the expense and charges of the Testing Laboratory when:
 - 1. the contractor gives notice that his work is ready for inspection and testing, and the contractor fails to be ready for the test, and/or
 - 2. the test of the contractor work products or materials fail, and retesting is required, and/or
 - 3. the contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

Products and materials used in the work shall conform to the following:

2.1 GENERAL REQUIREMENTS

- A. All material or products that come into contact with drinking water shall be third party certified as meeting the specifications of the American National Institute/National Sanitation Foundation Standard 61, Drinking Water System Components – Health Effects. The American National Standards Institute shall accredit the certifying party.
- B. All pipe, fittings, packing, jointing materials, valves, and fire hydrants shall conform to Section C of the AWWA Standards.

2.2 PIPE

- A. Ductile Iron Pipe - Shall conform to ANSI A-21.50 (AWWA C-150) and ANSI A-21.51 (AWWA C-151). All pipe shall be Pressure Class 350 unless otherwise noted. It shall be cement lined in accordance with ANSI A-21.4 (AWWA C-104).
- B. P.V.C. – All pipe shall be blue in color with factory marked homing lines. Pipe 4 inches through 12 inches shall conform to all requirements of AWWA C-900, DR 18, pressure class of 235 p.s.i. and shall have the following minimum wall thickness:

4 inches	0.267 inches
6 inches	0.383 inches

8 inches	0.503 inches
10 inches	0.617 inches
12 inches	0.733 inches

Pipe 14 inches through 18 inches in diameter shall conform to all the requirements of AWWA C 905, DR 18, pressure rating of 235 p.s.i.

Pipe with diameter less than 4 inches shall conform to all requirements of ASTM D-1784 and D-2241 (SDR 21). The pipe shall have a minimum pressure rating of 200 p.s.i. Certificates of conformance with the foregoing specifications shall be furnished with each lot of pipe supplied. All P.V.C. pipe shall bear the National Sanitation Foundation Seal of Approval.

- C. Plastic Tubing - Tubing for service lines shall be:

Polyethylene Tubing: CTS PE 3408 conforming to all requirements of AWWA C-901 and ASTM D-2737 (SDR9). The tubing shall be copper tubing size and rated for a minimum working pressure of 200 p.s.i. Marking on the tubing shall include: nominal tubing pipe size; type of tubing material - PE 3408; SDR 9; pressure rating - 200 p.s.i.; ASTM D-2737; manufacturer's name and seal of the National Sanitation Foundation.

2.3 JOINTS

- A. Flanged Joints – Shall conform to ANSI A-21.15 (AWWA C-115). Bolts shall conform to ANSI B-18.2.1 and nuts shall conform to ANSI B-18.2.2. Gaskets shall be rubber, either ring or full face, and shall be 1/8 inch thick. Gaskets shall conform to the dimensions recommended by AWWA C-115 latest revision.
- B. Mechanical Joints – In ductile iron pipe shall conform to ANSI A-21.11 (AWWA C-111).
- C. Push-On-Joints – In ductile iron pipes shall conform to ANSI A-21.11 (AWWA C-111).
- D. Plastic Pipe – Joints in plastic pipe 4 inches and larger shall meet all requirements of AWWA C-900. Joints in plastic pipe 14 inches through 18 inches shall meet all requirements of AWWA C905. Joints in plastic pipe with a diameter less than 4 inches shall conform to ASTM D-3139.
- E. Restrained Joints – Restrained joints for pipe, valves and fittings shall be mechanical joints with ductile iron retainer glands equivalent to "Megalug" or push-on type joints equivalent to "Lok-Ring," "TR Flex," or "Super Lock" and shall have a minimum rated working pressure of 250 p.s.i. for ductile iron pipe and 100 p.s.i. with a minimum safety factor of 2:1 for PVC pipe. The joints shall be in accordance with the applicable portions of AWWA C-111. The manufacturer of the joints shall furnish certification, witnessed by an independent laboratory, that the joints furnished have been tested without signs of leakage or failure. Restrained joints shall be capable of being deflected after assembly.
- F. Natural rubber or other material which will support microbiological growth may not be used for any gaskets, o-rings, and other products used for jointing pipes,

setting meters and valves or other appurtenances which will expose such material to water.

2.4 FITTINGS

- A. Fittings for Ductile Iron or Plastic Pipe – Shall be ductile iron, manufactured in accordance with ANSI A-21.53 (AWWA C-153). They shall be cement lined in accordance with ANSI A-21.4 (AWWA C-104). Fittings shall be designed to accommodate the type of pipe used.
- B. Fittings for Flanged Pipe – Shall be manufactured in accordance with ANSI A-21.10 (AWWA C-110), Class 125 flanges.
- C. Fittings for Plastic Pipe – Less than 4 inches shall be PVC with ring tite rubber joints conforming to ASTM D-3139.

2.5 GATE VALVES

- A. Two Inches and Larger – Shall be cast iron or ductile iron body, bronze mounted, double disc or resilient wedge design, with non-rising stems, conforming to AWWA C-500, C-509, or C-515. Valves shall have a working pressure of 200 p.s.i. and be tested at 400 p.s.i.

Valves shall be furnished with "O" ring packing. Two "O" rings shall be located above the thrust collar and one "O" ring below. The thrust collar shall be permanently lubricated and have an anti-friction washer on top of the thrust collar.

Valves installed in pits or above ground shall be furnished with hand wheels. Buried valves shall be furnished with square operating nuts.

- B. Smaller than 2 Inches – Shall be all brass, ball valve type. The pressure rating shall be 175 p.s.i.
- C. Valve Boxes – Underground valves shall be installed in acceptable valve boxes. The valve boxes shall have a suitable base which does not damage the pipe, and shaft extension sections to cover and protect the valve and permit easy access and operation. The box, cover, and any extensions needed shall be cast or ductile iron having a crushing strength of 1,500 pounds per linear foot. Valve boxes shall conform to the detail shown.
- D. Valve Manholes –
 1. Masonry – Shall be new whole brick of good quality laid in masonry mortar or cement mortar made of 1 part Portland cement and 2 parts clean sharp sand. Every brick shall be fully bedded in mortar. Manholes shall conform to the locations and details shown on the plans.
 2. Precast Concrete – Shall be reinforced concrete constructed in accordance with ASTM C 478 and the details shown on the plans "Precast Concrete Manholes." The joints shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or equivalent to

Type A or B "Tylox" conforming to ASTM C 443. Mastic shall be equivalent to "Ram-nek" with primer. The primer shall be applied to all contact surfaces of the manhole joint at the factory in accordance with the manufacturer's instructions.

3. Frames and Covers – Shall be cast iron equivalent to the following:

Neenah Foundry Co. R-1668 Type "C" Lid

- E. Flush valves – Shall conform to the details shown.

2.6 BUTTERFLY VALVES

- A. All butterfly valves shall be of the tight-closing, rubber seated type, with rubber seat positively locking in place sealing against flow from either direction. No metal-to-metal seating surfaces will be permitted. Valves shall be bubble-tight at rated pressures with flow in either direction. Butterfly valves shall conform to ANSI/AWWA C504, Class 150B. Butterfly valves shall not be used on pipe smaller than 14-inches unless otherwise specified.
 1. Valve body end connections for buried valves shall be installed using restrained joints equivalent to those manufactured by EBAA Iron, Inc.
 2. Valve shafts shall be stainless steel and may consist of a one-piece unit or may be the "Stub Shaft" type. A stub shaft comprises two separate shafts inserted into the valve disc hubs. Each stub shaft shall be inserted into the valve disc hubs for a distance of at least 1-1/2 shaft diameters.
 3. Valve discs shall be solid ductile iron with an epoxy coating making it corrosion resistant. The thickness of the discs shall not exceed 2-1/4 times the shaft diameter.
 4. Valve seats shall be natural or synthetic rubber providing 360 degrees uninterrupted seating. The resilient seat shall be adjustable or replaceable in the field without burning or grinding. The seat shall be molded over a stainless steel ring for support and secured to the disc by corrosion resistant, self locking stainless steel screws.
 5. All internal ferrous metal surfaces in the waterway shall be factory coated with a non-toxic, to-component, holiday-free, thermosetting epoxy to a nominal thickness of 4 mils.
 6. All butterfly valves shall be manually operated. Operators shall be of the traveling nut, self-locking type and shall be designed to hold the valve in any intermediate position without creeping or fluttering. Operators shall be furnished with externally adjustable mechanical stop limiting devices. Valves shall have a 2 inch square operating nut and shall be installed with extension stem to extend the operating nut in accordance with the project details. The operator shall be integrally mounted on the valve mounting flange and shall have a gearing totally enclosed for buried service. Maximum force for operating nut shall be 40 pounds.

- B. Valve Boxes – Underground valves shall be installed in approved valve boxes. The valve boxes shall have a suitable base that does not damage the pipe, and shaft extension sections to cover and protect the valve and permit easy access and operation. The cover, box, and any extensions needed shall be cast or ductile iron having a crushing strength of 1,500 pounds per linear foot. Valve boxes shall conform to the detail shown.
- C. Valve Manholes –
1. Masonry – Shall be new whole brick of good quality laid in masonry mortar or cement made of one part Portland cement and two parts clean sharp sand. Every brick shall be fully bedded in mortar. Manholes shall conform to the locations and details shown on the plans.
 2. Precast Concrete – Shall be reinforced concrete constructed in accordance with ASTM C 478 and the details shown on the plans "Precast Concrete Manholes." The joints shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or equivalent to Type A or B "Tylox" conforming to ASTM C 443. Mastic shall be equivalent to "Ram-nek" with primer. The primer shall be applied to all contact surfaces of the manhole joint at the factory in accordance with the manufacturer's instructions.
 3. Frames and Covers – Shall be cast iron equivalent to the following:

Neenah Foundry Co. R-1668 Type "C" Lid

2.7 AIR RELEASE, AIR/VACUUM AND COMBINATION AIR VALVES

- A. Shall be designed for water service with a minimum working pressure of 100 p.s.i. The valve shall be constructed of a cast iron body, stainless steel or bronze trim, and stainless steel float. The inlet shall be 2 inches, 5/16 inch orifice, and a minimum venting capacity of 35 c.f.f.a.m. It shall conform to the detail shown on the drawings. Valves shall conform to AWWA C 512 and equivalent to Crispin or Valmatic.

2.8 FIRE HYDRANTS

- A. General – Hydrants shall be manufacturer's current model design and construction. All units to be complete including joint assemblies. Physical characteristics and compositions of various metal used in the hydrant components shall meet the requirements as specified in AWWA C-502 latest revision. Hydrants shall be suitable for working pressure of 150 p.s.i.
- B. Bonnet – Bonnet may have oil filled or dry reservoir. If oil filled, bonnet must have "O" ring packing so all operating parts are enclosed in a sealed oil bath. Oil filler plug shall be provided in bonnet to permit checking of oil level and adding oil when required. If dry type, hydrant top must have lubricating hole or nut for ease of lubrication. All parts must be removed through top of hydrant without moving entire barrel section from safety flange.

- C. Nozzles and Caps – The hydrant shall have two 2-1/2 inch nozzles and one 4 inch nozzle. Nozzles shall be bronze and have interlocking lugs to prevent blowout. Nozzle caps shall be secured to fire hydrant with non-kinking type chain with chain loop on cap ends to permit free turning of caps.
- D. Seat Ring – Seat ring shall be bronze.
- E. Drain Valves and Openings – Positive operating drain valves shall be provided to assure drainage of fire hydrant when the main valve is closed. Drain openings shall have bronze bushings.
- F. Main Valve – Valve shall be designed to close with the pressure and remain closed. Valve shall be made from material resisting damage from rocks or other foreign matter. Valve shall have a minimum 5-1/4 -inch opening.
- G. Barrel and Safety Flanges – Hydrants shall have a safety-type vertical barrel with 3 1/2 foot bury and be designed with safety flanges and/or bolts to protect the barrel and stem from damage and to eliminate flooding when hydrant is struck. Bury depth shall be cast on barrel of hydrant.
- H. Operating Stop and Nut – Hydrant shall have a positive stop feature to permit opening of hydrant without over travel of stem. Operating nut shall be bronze, 1-1/2-inch, point to flat, pentagon.
- I. Bolts and Nuts – Bolts, washers and nuts shall be corrosion resistant.
- J. Inlet – Bottom inlet of hydrant shall be provided with mechanical joint connection as specified and shall be 6 inch nominal diameter.
- K. Direction of Opening – Hydrant shall be designed to close "right" or clockwise and open "left" or counter-clockwise.
- L. Coatings – All inside and outside portions of hydrant shall be coated in accordance with AWWA C-502. The exterior portion of hydrant above ground level shall be painted with two coats of best grade zinc chromate primer paint and with two coats of approved hydrant enamel. Color shall be Factory Safety Yellow unless otherwise designated by Owner.
- M. Joint Assemblies – Complete joint assemblies consisting of gland, gasket, bolts, and nut shall be furnished for mechanical joint inlets.

2.9 SERVICE CONNECTIONS

- A. Taps in pipe larger than 3 inches shall be made with a tapping machine. A corporation stop shall be installed at the connection to the main. The corporation stop shall be brass manufactured in conformance with AWWA C-800. Inlet and outlet threads shall conform to AWWA C-800.

Corporation stops shall be 1 inch equivalent to Mueller H-15008 or B-25008 with a stainless steel stiffener. Service saddles shall have 1 inch AWWA taps, equal to Ford Styles 202B or S70. Contractor shall adhere to pipe manufacturer's recommendations on maximum tap sizes for each main size.

- B. Taps for services in PVC pipe 3 inches and smaller shall be equivalent to Romac Industries Style 306 Saddle or a PVC Tee. The connection shall be capable of withstanding internal water pressure continuously at 150 p.s.i. House service lines will be 1-inch polyethylene tubing with a curb stop at the property line. The end of the service lateral at the property line shall be marked with a 2 x 4 stake, 36 inches long with the top 6 inches above the ground and painted blue. The depth of the pipe shall be marked on the back of the stake. Location of service line must appear on the "as-built" information and record drawings.

2.10 TAPPING SLEEVES

- A. Shall be mechanical joint type sized to fit the intercepted pipe. They shall have duck-tipped end gaskets and shall be equal to Mueller H-615/715 with a tapping valve attached. The outlet end of the valve shall have a joint suitable for the type of pipe to be used in the new branch. Sleeve shall be sized to fit the intercepted pipe without leaking.

2.11 CURB STOPS

- A. At the end of the service line, where the meter is to be installed, a 1 inch brass ball valve shall be installed. The unconnected end shall be closed inside I.P. thread. All ball valves shall be ¼ turn valves and the full open and closed position shall be controlled by check lugs. The pressure rating shall be 175 p.s.i. The ball valves shall be equivalent to Ford Ball Valve No. B41-444W.

2.12 BACKFLOW PREVENTER ASSEMBLY

- A. Reduced Pressure – Shall consist of two independently operating check valves, one differential relief valve located between the two check valves, two resilient seat gate valves, and four properly placed resilient seated test cocks. Backflow preventer 2 inches and smaller shall have a bronze valve body. Backflow preventer greater than 2 inches shall be ductile iron or stainless steel. All internal parts in the check and relief valves shall be made of series 300 stainless steel or polymer materials suitable for potable water and rated for 175 p.s.i. working pressure. The assembly shall be constructed so all internal parts can be serviced or removed while in line. Assembly must be factory assembled and tested. Backflow preventer shall be equivalent to Febco Model 860 or Ames Model 4000 SS.
- B. Double Check – Shall consist of two independently operating check valves, two resilient seat gate valves, and four properly placed resilient seated test cocks. Backflow preventer 2 inches and smaller shall have a bronze valve body. Backflow preventer greater than 2 inches shall be ductile iron or stainless steel. All internal parts in the check valves shall be made of Series 300 stainless steel or polymer materials suitable for potable water and rated for 175 p.s.i. working pressure. The assembly shall be constructed so all internal parts can be serviced or removed while in line. Assembly must be factory assembled and tested. Backflow preventer shall be equivalent to Febco Model 805 YD or Ames Model 2000 SS.

2.13 CASING

- A. Casing pipe shall be steel conforming to ASTM A 139, yield point of 35,000 p.s.i., of the diameter shown on the contract drawings for each crossing. The minimum wall thickness shall be 0.25 inches.

2.14 CASING SPACERS

- A. Casing spacers shall be bolt on style with a shell made in two sections of a minimum 14 gauge T-304 Stainless Steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner. All nuts and bolts shall be T-304 Stainless Steel. Runners shall be made of Ultra High Molecular Weight Polymer with inherently high abrasion resistance and a low coefficient of friction. The combined height of supports and runners shall keep carrier pipe a minimum of 0.75 inches from casing pipe at all times. Casing Spacers shall be as manufactured by Cascade Waterworks Manufacturing Company, or accepted equivalent.

2.15 METAL DETECTOR TAPE

- A. The tape shall consist of 0.35 mils thick solid foil core encased in a protective plastic jacket resistant to alkalis, acids, and other destructive elements found in the soil. The lamination bond shall be strong enough the layers cannot be separated by hand. Total composite thickness to be 5.0 mils. Foil core to be visible from unprinted side to ensure continuity. The tape shall have a minimum 3-inch width and a tensile strength of 35 lbs. per inch.

A continuous warning message indicating "potable water" repeated every 16 inches to 36 inches shall be imprinted on the tape surface. The tape shall contain an opaque color concentrate designating the color code appropriate to the line being buried (Water Systems - Safety Precaution Blue).

2.16 TRACING WIRE

- A. Tracing wire shall be # 12 gauge insulated single strand copper wire.

2.17 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. The Engineer will review all products before they are ordered.

PART 3 – EXECUTION**3.1 ON-SITE OBSERVATION**

- A. Owner's Representative or Engineer shall have the right to require any portion of work be completed in their presence. If any work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if Contractor notifies Engineer such work is scheduled, and Engineer fails to appear within 48 hours, the Contractor may proceed. All work completed and materials

furnished shall be subject to review by the Engineer or Project Representative. Improper work shall be reconstructed. All materials which do not conform to requirements of specifications shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Project Engineer or Project Representative a minimum of 48-hours notice for all required observations or tests.

It will also be required of Contractor to keep accurate, legible records of the location of all water lines, service laterals, valves, fittings, and appurtenances. These records will be prepared in accordance with the paragraph on "Record Data" in Special Conditions. Final payment to the Contractor will be withheld until all such information is received and accepted.

3.2 INSTALLATION

- A. Ductile iron pipe shall be laid in accordance with AWWA C-600; Plastic pipe shall be laid in accordance with AWWA C 605, ASTM D 2774, UNI-Bell UNI-B 3 and the pipe manufacturer's recommendations. The standards are supplemented as follows:
1. Depth of Pipe – Contractor shall perform excavation of whatever substances are encountered to a depth providing a minimum cover over top of pipe of 36 inches from the existing or proposed finished grade, unless pipe material is steel, concrete, ductile iron, or other accepted material, and if exposed, should be insulated to prevent freezing.
 2. Alignment and Grade – Water mains shall be laid and maintained to lines and grades established by the plans and specifications, with fittings, valves, and hydrants at required locations unless otherwise accepted by Owner. Valve-operating stems shall be oriented in a manner to allow proper operation. Hydrants shall be installed plumb.
 - a. Prior Investigation – Prior to excavation, investigation shall be made to the extent necessary to determine location of existing underground structures, utilities, and conflicts. Care shall be exercised by the Contractor during excavation to avoid damage to existing structures and utilities. Pipe manufacturer's recommendations shall be used when the watermain being installed is adjacent to a facility cathodically protected.
 - b. Unforeseen Obstructions – When obstructions not shown on plans are encountered during progress of work, and interfere so an alteration of the plans is required, Owner will alter plans, or order a deviation in line and grade, or arrange for removal, relocation, or reconstruction of obstructions.
 - c. Clearance – When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the acceptance of Engineer, to provide clearance as required by federal,

state, and local regulations or as deemed necessary by Engineer to prevent future damage or contamination.

3. Trench Construction – The trench shall be excavated to alignment, depth, and width specified or shown on plans and shall be in conformance with all federal, state, and local regulations for protection of workers.
4. Joint Restraint – All hydrants, bends, plugs, valves, caps and tees on 2 inch pipe and larger, shall be provided with stainless steel tie rods or joint restraints equivalent to Megalugs. Additional restraint shall be as indicated on the drawings.
5. Anchorage for Hydrants - A concrete block 1 foot x 1 foot x 2 feet shall be poured between back of hydrant and undisturbed earth of the trench side without covering weep holes and bolts. Joint restraints equivalent to Megalugs manufactured by EBAA Iron may be used in lieu of concrete blocking.
6. Hydrostatic and Leakage Tests – Ductile iron pipe shall be tested in accordance with AWWA Standard C 600, Section 5.2 – Hydrostatic Testing. Allowable leakage shall not exceed the formula $L = SDP^{1/2}/148,000$, in which L is allowable leakage in gallons per hour; S is length of pipe in feet tested; D is nominal diameter of pipe in inches; and P is average test pressure during leakage test in pounds per square inch gauge. Test shall be conducted for at least 2 hours and a pressure of 150 p.s.i. shall be maintained during the test. Fire lines shall be tested at 225 p.s.i. for the same duration.

P.V.C. pipe shall be tested in accordance with AWWA Standard C 605, Section 7.3 – Hydrostatic Testing. Allowable leakage shall not exceed formula $Q = LDP^{1/2}/148,000$, in which Q is allowable leakage in gallons per hour; L is length of pipe in feet tested; D is nominal diameter of the pipe in inches; and P is average test pressure during leakage test in pounds per square inch gauge. Test shall be conducted for at least 2 hours and a pressure of 150 p.s.i. shall be maintained during the test. Fire lines shall be tested at 225 p.s.i. for the same duration.

Should any test of pipe laid disclose leakage greater than the above specified, Contractor shall, at its own expense, locate and repair defective joints until leakage is within specified allowance. Contractor is responsible for notifying the Engineer 48 hours (minimum) prior to applying pressure for testing. Pressure test will be witnessed by Engineer or Project Representative. All visible leaks shall be repaired regardless of the leakage amount.

7. Bedding, Backfilling, and Compaction – Continuous and uniform bedding shall be provided for all buried pipe. All trenches and excavation shall be backfilled immediately after pipes are laid therein, unless other protection of the pipe line is directed. The backfilling material shall be selected and deposited with special reference to future safety of the pipes. The material shall be completely void of rocks, stones, bricks, roots, sticks, or any other debris causing damage to pipe and tubing or preventing

proper compaction of backfill. Except where special methods of bedding and tamping are provided for, clean earth or sand shall be solidly tamped about pipe up to a level at least 2 feet above top of pipes, and shall be carefully deposited to uniform layers, each layer solidly tamped or rammed with proper tools to not injure or disturb the pipeline. The remainder of trench backfilling shall be carried on simultaneously on both sides of pipe in such manner preventing injurious side pressure. Material used shall be selected from excavations anywhere on site if any of the soil is suitable. Stones, other than crushed bedding, shall not come in contact with the pipe and shall not be within 6 inches of any pipe.

Under traffic areas, the top 24 inches of backfill material shall be compacted to a density of not less than 98% of maximum laboratory density at optimum moisture as determined by ASTM D 6938. Below the 24 inch line, and including area around pipe, density shall not be less than 95% of maximum laboratory density, at optimum moisture. In areas other than traffic areas, the backfill shall be compacted to 90% of maximum laboratory density at optimum moisture.

Whenever trenches have not been properly filled, or if settlement occurs, they shall be refilled, smoothed off, and finally made to conform to the ground surface. Backfilling shall be carefully performed, and the original surface restored to full satisfaction of Engineer immediately after installation.

Where thermoplastic (PVC) pipe is installed, Contractor shall take precautions, in accordance with ASTM D-2774, during backfilling operations, not to create excessive side pressures, or horizontal or vertical deflection of the pipe, nor impair flow capacity.

8. New Service Connections – Contractor shall tap the main and install a service connection to each vacant lot or as directed by Engineer in accordance with detail shown on plans for Water Service Connections. Plastic tubing for service lines shall be installed in a manner preventing abrupt changes or bends in any direction. Contractor shall exercise extreme caution to prevent crimping of the tubing during handling, storage, and installation. Tubing shall have an absolute positive connection to the water main to prevent leakage. Taps shall be made perpendicular to the main. A water service connection shall be marked on the curb with a "W." The mark shall be made with a branding iron on vertical face of curb and shall be a minimum of 1/4-inch in depth.
9. Detection Tape – Detection tape will be used over all pipe and tubing. The tape shall be laid 18 inches below finished grade.
10. Tracing Wire – Tracing wire will be installed on all water mains and water service laterals directly on top of the water line. The wire shall be secured to the pipe with tape or other acceptable methods at spacings of no more than 36 inches apart. Where water service laterals connect to water mains, the wire insulation shall be stripped so bare wires can and shall be jointed securely together and wrapped with a rubberized insulation tape. The insulated wire must maintain electrical continuity. The

tracing wire shall also be stubbed up into each valve box and at each fire hydrant. Stub up connections shall be stripped, joined and wrapped as previously described for water service laterals. This tracing wire system shall be checked and tested by Contractor, in the presence of Engineer or water department, prior to acceptance of water main installation. All equipment, meters, detectors, etc., needed for testing shall be furnished by the Contractor.

11. Jacking and Boring – Steel casing of diameter shown on the plans shall be jacked and bored in location indicated. Joints between sections of the steel casing shall be of a continuous weld made by a certified welder. Jacking and boring shall be in accordance with the State Department of Transportation Standard Specifications. Carrier pipe shall be installed as shown on the detail. After carrier pipe has been installed, ends of the casing shall be sealed using a rubber enclosure and stainless steel straps or brick and mortar.

Where work involves a highway, Resident Engineer of the State Department of Transportation shall be notified 3 days before crossing is started. Where the work involves a railroad, installation shall conform to requirements of AREA specifications. Division Superintendent of the Railroad shall be notified three days prior to beginning work. Before commencing work within right-of-way of railroads or highways, Contractor shall verify the Owner has obtained required permits.

12. Lubricants – Lubricate pipe before jointing per manufacturer's recommendations using acceptable lubricants. Lubricants that will support microbiological growth shall not be used. Vegetable shortening shall not be used to lubricate joints.
13. Hydrant drains shall not be connected to or located within 10-feet of sanitary sewers. No flushing device shall be directly connected to any sewer.
14. Pipe for above water crossings shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair or replacement.
15. Underwater line crossings shall have a minimum 2 feet of cover over the pipe. When crossing water courses greater than fifteen 15 feet in width, the following shall be provided:
 - a. The pipe material and joints shall be designed appropriately.
 - b. Valves shall be located on both sides of crossing so the section can be isolated for testing or repair. Valves shall be easily accessible and not subject to flooding.
 - c. A blow-off shall be provided on the side opposite the supply, sized in accordance with State Drinking Regulation Section R.61-58.4(D)(7). Direct blow-off away from streams, over ground.

- d. Provide ductile iron pipe with mechanical joints for any lines installed in rock.

3.3 AIR RELEASE, AIR/VACUUM AND COMBINATION AIR VALVES

- A. Valves shall be installed in locations as shown on the contract drawings. The Contractor shall verify high points in the water line and notify Engineer of differing conditions from the drawings.
- B. Valves shall be opened during initial filling of the water main. Valves shall be closed during hydrostatic testing. Once tested and the system is accepted for operation, valves shall be opened when water lines are put on line.

3.4 CONNECTIONS OF WATER MAINS

- A. Any physical connection of untested water mains with existing water mains is prohibited except when acceptable backflow prevention devices have been installed and checked by Engineer or Engineer's Representative.
 1. Any new water main to be tested must be capped and restrained with retaining glands or thrust blocks to prevent blow out or leakage during the pressure testing.
 2. Water for filling or flushing a new water main will be obtained through a Temporary Jumper Connection to the existing main. Appropriate taps of sufficient size must be made at the end of new system to allow air to escape during filling sequence.
 3. This physical tie-in with the existing system must be physically disconnected after sufficient water for hydrostatic testing and disinfection has been obtained.
 4. Once the new water system has demonstrated adequate hydrostatic testing and has been flushed and chlorinated in accordance with paragraph 3.5, the new system or main will then be subjected to bacteriological testing.
 5. Permanent connection to the new system must be made with clean materials. The connection may be made with either solid or split ductile iron sleeves. Any connection with stainless steel or similar metal full circle clamps is prohibited. Once connection has been made, the new system must be flushed using water from existing system to insure adequate flow and velocity into new water system.

3.5 DISINFECTION

- A. After the hydrostatic and leakage tests have been completed, water pipes shall be disinfected in accordance with AWWA C 651 and Regulations of the local Health Department.

All new mains shall be thoroughly flushed then chlorinated with not less than fifty parts per million (50 ppm) of available chlorine. Chlorine gas or 70% high-test

calcium hypochlorite can be used. Water from existing distribution system or other source of supply should be controlled to flow slowly into the newly laid pipeline during application of chlorine. The solution shall be retained in pipeline for not less than 24 hours and a chlorine residual of 25 ppm shall be available at this time. Then system shall be flushed with potable water and the sampling program started. Prior to sampling, the chlorine residual must be reduced to normal system residual levels or be non-detectable in those systems not chlorinating. Normal system residual should be between 0.2 and 0.8 ppm. The chlorine residual shall be measured and reported. If the membrane filter method of analysis is used for coliform analysis, non-coliform growth must also be reported. If non-coliform growth is greater than eighty colonies per one hundred milliliters, the sample result is invalid and must be repeated.

A minimum of two samples from each sampling site shall be collected for total coliform analysis. The number of sites depends on amount of new construction, but must include all dead end lines, be representative of water in newly constructed mains, and shall be collected a minimum of every 1,200 linear feet. Each set of samples shall be taken at least 24 hours apart after disinfection and tested by a State approved lab and shall indicate bacteriological satisfactory water. Contractor shall submit the results to the Engineer.

3.6 PARTIAL ACCEPTANCE OF THE WORK

- A. Owner reserves right to accept and use any portion of the work. Engineer shall have power to direct on what line Contractor shall work and the order thereof.

3.7 GRASSING

- A. Grassing of areas disturbed during construction shall be in accordance with the Section 02902 "Grassing."

3.8 SEPARATION BETWEEN WATER AND SANITARY SEWER OR FORCE MAIN

- A. Water mains shall be laid at least 10 feet horizontally from any existing or proposed sanitary sewer or force main. Deviation may be allowed for installation of the water main closer to a sanitary sewer or force main, provided water main is laid in a separate trench, where bottom of water main is at least 18-inches above top of sanitary sewer or force main. Water mains crossing sanitary sewers or force mains shall be laid to provide a minimum vertical distance of 18 inches between the invert of water main and top of sanitary sewer or force main line; both water and sanitary sewer or force main lines must be ductile iron when laid in violation of separation requirements. At all water and sanitary sewer or force main crossings, one full length of water pipe shall be located so both joints will be as far from the sanitary sewer or force main as possible.
- B. When it is impossible to obtain distances specified in Section R.61-58.4(D)(12)(a) and (b) of the State Primary Drinking Water Regulations, an alternate, SCDHEC accepted design may be allowed. The alternate design must:
 - 1. maximize distances between the water main and sewer line and joints of each;

- 2. use materials which meet requirements cited in Section R.61-58.4(D)(1) of the State Primary Drinking Water Regulations for sewer line; and
- 3. Allow enough distance to make repairs to one of the lines without damaging other.

3.9 REMOVE AND REPLACE PAVEMENT

- A. Pavement shall only be removed after prior written authorization by the Owner. Pavement removed and replaced shall be constructed in accordance with latest specifications of the State Department of Transportation. Traffic shall be maintained and controlled per State Department of Transportation regulations.

Edges of the pavement shall be cut to a neat straight line with a masonry saw. Backfill shall be compacted and tested and a concrete base course of 5,000 p.s.i. placed on compacted fill as shown in the details. The concrete base shall be placed within 24 hours after water line is installed. A temporary wearing surface may be used provided it presents a smooth surface. The final wearing surface shall be 1-1/2 inches asphaltic concrete, Type C.

3.10 FIELD QUALITY CONTROL

- A. Soil and density tests shall be made by a testing laboratory acceptable to Engineer. Laboratory tests of the soil shall be made in accordance with ASTM D 1557. In-place density tests shall be made in accordance with ASTM D 6938. Results of tests shall be furnished to the Engineer.

The minimum number of tests required shall be:

Backfill over pipe
in traffic areas. 1 per 100 linear feet or less for each 4 feet of depth or portion thereof.

Backfill over pipe
in non-traffic areas. . . . 1 per 500 linear feet or less for each 4 feet of depth or portion thereof.

The minimum percent of backfill compaction, in accordance to ASTM D1557, shall be the following:

In traffic Areas. 98% of maximum laboratory density.

In non-traffic Areas. . . . 90% of maximum laboratory density, unless otherwise accepted by the Engineer.

END OF SECTION

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SECTION 02720
STORM DRAINAGE

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Construction of pipes and beveled end sections.

1.2 RELATED SECTIONS

- A. Section 02210 – Soil Erosion Control
- B. Section 03305 – Site Concrete

1.3 OPTIONS

- A. The bid form and specifications describe several pipe materials. Owner will select the one to be used. Where manufacturers of material or equipment are named in the specifications, Contractor may use equipment or materials of other manufacturers provided they are reviewed and accepted by Engineer as equivalent to those specified.

1.4 REFERENCES (Latest Revision)

- A. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.
- C. ASTM C 76 – Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- D. ASTM C 443 – Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
- E. ASTM D 1751 – Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- F. ASTM D 1752 – Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- G. ASTM C 150 – Portland Cement.
- H. ASTM C 144 – Aggregate for Masonry Mortar.
- I. ASTM C 207 – Hydrated Lime for Masonry Purposes.
- J. ASTM C 62 – Building Brick (Solid Masonry Units Made from Clay or Shale).
- K. ASTM C 55 – Concrete Brick.

- L. ASTM C 478 – Precast Reinforced Concrete Manhole Sections.
- M. ASTM C 1433 – Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers.
- N. ASTM D 698 – Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
- O. ASTM D 6938 – In Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- P. ASTM C 913 – Precast Concrete Water and Wastewater Structures.

1.5 QUALITY ASSURANCE

- A. Material Review – Contractor will furnish the Engineer and Owner a description of all material before ordering. Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Manufacturer – Material and equipment shall be standard products of a manufacturer who has manufactured them for a minimum of 2-years and provides published data on their quality and performance.
- C. Subcontractor – A subcontractor for any part of the work must have experience on similar work, and if required, furnish Engineer with a list of projects and Owners or Engineers who are familiar with their competence.
- D. Design – Devices, equipment, structures, and systems not designed by Engineer and Contractor wishes to furnish, shall be designed by either a Registered Professional Engineer or by someone the Engineer accepts as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or Owner before ordering.
- E. Testing Agencies – Soil tests shall be taken by a testing laboratory operating in accordance to ASTM D-3740 and E-329 and be acceptable to the Engineer prior to engagement. Mill certificates of tests on materials made by manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests, spot checked by an outside laboratory and furnishes satisfactory certificates.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Material shall be unloaded in a manner avoiding damage and shall be stored where it will be protected and will not be hazardous to traffic. Contractor shall repair any damage caused by the storage. Material shall be examined before installation. Neither damaged nor deteriorated material shall be used in the work.

1.7 SEQUENCING AND SCHEDULING

- A. Contractor shall arrange work so sections of pipes between structures are backfilled, checked, pavement replaced, and the section placed in service as soon as reasonable after installation.

1.8 ALTERNATIVES

- A. The intention of these specifications is to produce the best system for the Owner. If Contractor suggests alternate material, equipment or procedures will improve results at no additional cost, the Engineer and Owner will examine suggestion, and if accepted, it may be used. The basis upon which acceptance of an alternate will be given is its value to Owner and not for Contractor's convenience.

1.9 GUARANTEE

- A. Contractor shall guarantee quality of materials, equipment, and workmanship for a minimum period of 12 months or as required by the local governing agency after acceptance. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

1.10 EXISTING UTILITIES

- A. All known utility facilities are shown schematically on the construction drawings and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown, will not relieve the Contractor of responsibility under this requirement. "Existing Utilities Facilities" means any utility existing on the project in its original, relocated, or newly installed position. Contractor will be held responsible for cost of repairs to damaged underground facilities; even when such facilities are not shown on the drawings.
- B. The Contractor shall call for underground utility locations before starting work. Underground utilities location service can be contacted at 1-888-721-7877 (SC).

1.11 MEASUREMENT AND PAYMENT

- A. Pipe Culverts and Storm Drains – Length of pipe will be paid for on a linear foot basis, as measured along the centerline, from end of pipe to end of pipe, end of pipe to center of structure or center of structure to center of structure. Payment of which will constitute full payment for all pipe, joints, filter fabric and bedding, including trenching, dewatering, excavation, backfill and compaction, surface clean-up, and all incidental labor and material necessary to complete the construction of pipe as required by this section of specifications.
- B. Headwall – Payment will be made on a contract unit price of each type. Payment will constitute full compensation for dewatering, excavation, formwork, all materials, and incidentals necessary to complete the construction.

- C. Beveled End Section – Payment will be made on a contract unit price of each type. Payment will constitute full compensation for dewatering, excavation, formwork, all materials, and incidentals necessary to complete the construction.

1.12 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 698 (Standard Proctor).
- B. In place density tests in accordance with ASTM D 1556 or ASTM D 698.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours notice prior to taking any tests.
- E. Owner shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all tests shall be by Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of testing laboratory when:
 - 1. Contractor gives notice work is ready for inspection and testing, and fails to be ready for the test, and/or
 - 2. testing of the Contractor's work, products, or materials fail, and retesting is required, and/or
 - 3. Contractor abuses the services or interferes with work of testing laboratory in conduct of this work.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 PIPE

- A. Concrete Pipe – Shall be reinforced Class III, Class IV, or Class V and shall conform to ASTM Specification C-76. Pipe less than 48 inch inside diameter shall be manufactured without lifting holes. Joints shall be 'O' ring watertight flexible rubber as indicated on the plans.
 - 1. 'O' Ring Joints – Shall be water tight flexible rubber gasket and shall meet ASTM Specification C-443.

2.2 DRAINAGE STRUCTURES

- A. Details – See plans.
- B. Concrete – Reinforced and non-reinforced.

1. Minimum compressive strength = 3,000 p.s.i. at 28 days.
 2. Reinforcing shall be covered by a minimum 1 inch of concrete for top slabs and 1-1/2 inches for walls and bases and 3 inches where concrete is deposited directly against the ground.
 3. Expansion joint filler materials shall conform to ASTM D 1751 or D 1752.
- C. Mortar – Connection of pipe and drainage structures shall be composed of one part by volume of Portland cement and two parts of sand. The Portland cement shall conform to ASTM C-150, Type I or II. The sand shall conform to ASTM C-144 and shall be of an accepted gradation. Hydrated lime may be added to the mixture of sand and cement in an amount equal to 25% of cement volume used. Hydrated lime shall conform to ASTM C-207, Type S. Quantity of water in the mixture shall be sufficient to produce a workable mortar, but shall in no case exceed 7 gallons of water per sack of cement. Water shall be clean and free of harmful acids, alkalis, and organic impurities. The mortar shall be used within 30 minutes from time ingredients are mixed with water.
- D. Brick Masonry – Brick shall conform to ASTM Specification C-62, Grade SW or C-55, Grade S. Mortar for jointing and plastering shall consist of one part Portland cement and two parts fine sand. Lime may be added to the mortar in an amount not more than 25% of the cement volume used. Joints shall be completely filled and shall be smooth and free from surplus mortar on the inside of structure. Brick structures shall be plastered with 1/2 inch of mortar over entire outside surface of the walls. For square or rectangular structures, brick shall be laid in stretcher courses with a header course every sixth course, and for round structures, brick shall be laid radially with every sixth course a stretcher course.
- E. Precast – Shall be constructed in accordance with ASTM C-478, C-913, or C-1433 and conform to details on the project drawings.
1. Joints – Shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or Type A or B "Tylox" conforming to ASTM C443 and mastic shall be "Ram-nek" or equivalent with primer. Primer shall be applied to all contact surfaces of manhole joints at the factory in accordance with manufacturer's instructions.
 2. Steps – Shall be polypropylene equivalent to M.A. Industries, Type PS-1 or PS-1-PF. Steps shall be installed at the manhole factory and in accordance with recommendations of step manufacturer. Manholes will not be acceptable if steps are not installed accordingly.
 3. Leaks – No leaks in the manhole will be acceptable. All repairs made from inside the manhole shall be made with mortar composed of one part portland cement and two parts clean sand; mixing liquid shall be straight bonding agent equivalent to "Acryl 60."
- F. Frame, cover & grating shall conform to details shown on the project drawings. Grates in pavement and in other flush-mounted type surfaces shall be of a "bicycle-safe" configuration consisting of 45 degree diagonal bars or slotted

grates with a maximum clear opening of 1 inch and a maximum length of 9–inches. In any case, the long dimension of openings should be located transverse to direction of traffic when possible.

2.3 FILTER FABRIC

- A. Shall be a non-woven heat-bonded fiber of polypropylene and nylon filaments equivalent to Mirafi 140 N. The fabric shall be finished so filaments will retain their relative position with respect to each other. Fabric shall contain stabilizers and/or inhibitors added to the base plastic to make filaments resistant to deterioration due to ultraviolet and/or heat exposure. The product shall be free of flaws, rips, holes, or defects.

2.5 SOILS AND STONE AGGREGATES

- A. Stone aggregate shall be clean crushed granite or concrete meeting the gradation requirements of grade No. 57.
- B. Soils used for bedding, haunching, and initial backfill shall be as shown in the following table and shall meet requirements and classifications of ASTM D2321 and ASTM D2487.

Class	Type	Soil Group Symbol D 2487	Description	Percentage Passing Sieve Sizes		
				1-1/2 inch (40 mm)	No. 4 (4.75 mm)	No. 200 (0.075 mm)
IB	Manufactured, Processed Aggregates; dense-graded, clean.	None	Angular, crushed stone (or other Class 1A materials) and stone/sand mixtures with gradations selected to minimize migration of adjacent soils; contain little or no fines.	100%	≤50%	<5%
II	Coarse – Grained Soils, clean	GW	Well-graded gravels and gravel-sand mixtures; little or no fines.	100%	<50% of “Coarse Fraction”	<5%
		GP	Poorly-graded gravels and gravel-sand mixtures; little or no fines.			
		SW	Well-graded sands and gravelly sands; little or no fines.		>50% of “Coarse Fraction”	
		SP	Poorly-graded sands and gravelly sands; little or no fines.			
	Coarse-Grained Soils; borderline clean to w/fines.	Eg. GW-GC, SP-SM.	Sands and gravels that are borderline between clean and with fines.	100%	Varies	5% to 12%
III	Coarse-Grained Soils with Fines	GM	Silty gravels, gravel-sand-silt mixtures.	100%	<50% of “Coarse Fraction”	5%
		GC	Clayey gravels, gravel-sand-			

			<i>clay mixtures.</i>		"	
		SM	<i>Silty sands, sand-silt mixtures.</i>		>50% of "Coarse Fraction "	
		SC	<i>Clayey sands, sand-clay mixtures.</i>			
IVA	<i>Fine-grained soils (inorganic)</i>	ML	<i>Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, silts with slight plasticity.</i>	100%	100%	>50%
		CL	<i>Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays.</i>			

2.6 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products by the submittal of shop drawings before they are ordered.

PART 3 – EXECUTION

3.1 ON SITE OBSERVATIONS OF WORK

- A. The line, grade, deflection, and infiltration of storm sewers shall be tested by Contractor under direction of Engineer. Owner's Representative or Engineer will have the right to require any portion of work be completed in their presence and if work is covered up after such instruction, it shall be exposed by Contractor for observation. However, if Contractor notifies Engineer such work is scheduled and the Engineer fails to appear within 48-hours, Contractor may proceed. All work completed, and material furnished shall be subject to review by the Engineer or Project Representative. All improper work shall be reconstructed. All materials not conforming to requirements of specifications shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Project Engineer or Project Representative a minimum of 48-hours' notice for all required observations or tests. Storm sewers shall be dry for observation by the Engineer. Lines under water shall be pumped out by Contractor prior to observation, at no additional cost to the Owner.

It will also be required of Contractor to keep accurate, legible records of the location of all storm sewer lines and appurtenances. These records will be prepared in accordance with paragraph on "Record Data and Drawings" in the Special Conditions. Final payment to the Contractor will be withheld until all such information is received and accepted.

3.2 EXCAVATION FOR PIPE

- A. Excavated material shall be piled a sufficient distance from the trench banks to avoid overloading to prevent slides or cave-ins.

- B. Remove from site all material not required or suitable for backfill.
- C. Grade as necessary to prevent water from flowing into excavations.
- D. Remove all water accumulating in the excavation, from surface flow, seepage, or otherwise, by pumping or other acceptable method.
- E. Sheet piling, bracing or shoring shall be used as necessary for protection of the work and safety of personnel.

3.3 TRENCHING FOR PIPE

- A. Trenching for Pipe – The width of trenches at any point below top of pipe shall be not greater than outside diameter of pipe plus 4-feet to permit satisfactory jointing and thorough bedding, haunching, backfilling and compacting under and around pipes. Sheet piling and bracing where required shall be placed within the trench width as specified. Care shall be taken not to over-excavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures shall be necessary. Cost of this re-design and increased cost of pipe or installation shall be borne by Contractor without additional cost to the Owner. When installing pipe in a positive projecting embankment installation, the embankment shall be installed to an elevation of at least 1 foot above top of pipe for a width of five pipe diameters on each side of pipe before installation of pipe.
- B. Removal of Unsuitable Material – Where wet or otherwise unstable soil, incapable of supporting the pipe is encountered in bottom of trench, such material shall be removed to depth required and replaced to proper grade with stone or sand foundation as determined by Engineer. This foundation shall be compacted to 95% standard proctor.

3.4 PROTECTION OF UTILITY LINES

- A. Existing utility lines shown on drawings or locations of which are made known to the Contractor prior to excavation, and are to be retained, as well as utility lines constructed during excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired at Contractor's expense. If the Contractor damages any existing utility lines not shown on drawings or locations of which are not known to Contractor, report thereof shall be made immediately. If Engineer determines repairs shall be made by Contractor, such repairs will be ordered under the clause in GENERAL CONDITIONS of contract entitled "CHANGES." When utility lines to be removed are encountered within the area of operations, Contractor shall notify Engineer in ample time for necessary measures taken to prevent interruption of service.

3.5 FOUNDATION AND BEDDING

- A. Stone Foundation – Where the subgrade of pipe is unsuitable material, Contractor shall remove unsuitable material to a depth determined by Engineer or Geotechnical Consultant and furnish and place stone foundation in trench to stabilize subgrade.

- B. Sand Foundation – Where the character of soil is unsuitable, even though dewatered, additional excavation to a depth determined by Engineer or Geotechnical Consultant shall be made and replaced with clean sand furnished by Contractor.
- C. Bedding for pipe shall provide a firm surface of uniform density throughout the entire length of pipe. Before laying pipe, trench bottom shall be de-watered by the use of well points. Where well points will not remove the water, Contractor shall construct sumps and use pumps to remove all water from bedding surface. Pipe shall be carefully bedded in stone accurately shaped and rounded to conform to lowest 1/3 outside portion of circular pipe, or lower curved portion of arch pipe for the entire length of pipe. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making the particular type joint.
- D. Concrete Pipe:
 - 1. Materials for bedding concrete pipe shall be either Class II, Class III, or Class IB if processed, to minimize migration of adjacent material.
 - 2. Depth of bedding shall be equal to 1/24 the outer diameter of pipe or 3-inches, whichever is greater.
 - 3. Bedding area under the center of pipe, for a width 1/3 outer diameter of pipe, known as middle bedding, shall be loosely placed. Remainder of bedding for full width of the trench shall be compacted to a minimum density of 85% for Class II bedding and 90% for Class III bedding as determined by ASTM D1557.

3.6 HAUNCHING, INITIAL BACKFILL, AND FINAL BACKFILL

- A. Haunching – After the bedding has been prepared and pipe is installed, Class II or Class III soil shall be placed along both sides of pipe, in layers not exceeding 6-inches in compacted depth. Care shall be taken to insure thorough compaction and fill under haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers and rammers. Haunching shall extend up to the spring line of pipe and be compacted to following densities:
 - 1. RCP: Minimum density shall be 90% as determined by ASTM D698.
- B. Initial Backfill –Reinforced concrete pipe does not specifically require initial backfill. Initial backfill for reinforced concrete pipe can be the same as final backfill.
- C. Final Backfill – For all pipes, it should extend to the surface and shall be select materials compacted to a minimum of 98% as determined by ASTM D698 if pipe is under pavement. If pipe is in grassed areas final backfill may be native materials compacted to a minimum density of 90% as determined by ASTM D698.

3.7 PLACING PIPE

- A. Each pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used. Pipe lines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. All pipe in place shall have been checked before backfilling. When storm drain pipe terminates in a new ditch, headwall or end section, together with ditch pavement, if specified, shall be constructed immediately as called for on the plans. Ditch slopes and disturbed earth areas shall be grassed and mulched as required. Contractor will be responsible for maintaining these newly constructed ditches and take immediate action subject to acceptance, keeping erosion of the ditch bottom and slopes to a minimum during life of contract. No additional compensation will be given to Contractor for the required diversion of drainage and/or dewatering of trenches. Grassing the trench backfill shall conform to requirements of Section 02902 – “Grassing.”
- B. Concrete Pipe: Laying shall proceed upgrade with spigot ends of bell and spigot pipe and tongue ends of tongue and groove pipe pointing in the direction of flow. Place pipe in trench with the invert conforming to required elevations, slopes, and alignment. Provide bell holes in pipe bedding in order to insure uniform pipe support. Fill all voids under the pipe by working in backfill material.

3.8 JOINTS IN PIPES

- A. Concrete Pipe – Joints in concrete pipe shall be either ‘O’ ring watertight flexible rubber or tongue and groove as indicated on the plans. Gasketed, single offset joints may be used if accepted by the Engineer. Maintain pipe alignment and prevent infiltration of fill material at joints during installation.
1. ‘O’ ring and single offset joints shall meet the requirements of ASTM C443. They shall utilize either a rubber gasket with a circular cross section or a rectangular cross section. Gaskets shall have no more than one splice, except two splices of the gasket will be permitted if nominal diameter of pipe exceeds 54-inches. Manufacturer’s recommendations and requirements shall be followed.

3.9 FIELD QUALITY CONTROL

- A. Soil and density tests shall be made by a testing laboratory acceptable to the Engineer. Laboratory tests of the soil shall be made in accordance with ASTM D 698. In-place density tests shall be made in accordance with ASTM D 6938. Results of tests shall be furnished to the Engineer.

The minimum number of tests required shall be:

Haunching and Initial
Backfill in all areas....

1 per 100-linear feet of pipe, minimum of one per run of pipe for both the haunching and initial backfill zones.

Final Backfill over pipe in traffic areas.....	1 per 100-linear feet or less for each 4-feet of depth or portion thereof.
Final Backfill over pipe in non-traffic areas.....	1 per 500-linear feet or less for each 6-feet of depth or portion thereof.

The minimum percent of compaction of the backfill material (in accordance to ASTM D698) shall be the following:

In traffic Areas. 98% of maximum laboratory density.

In non-traffic Areas 90% of maximum laboratory density, unless otherwise
accepted by the Engineer.

- B. It is the Contractor's responsibility to assure backfill is sufficient to limit pipe deflection to no more than 5%. A deflection test shall be made by the Contractor on entire length of installed pipeline, not less than 30-days after completion of all backfill and placement of any fill. Deflection shall be determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. The ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 95% the inside pipe diameter. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface brinell hardness of not less than 150. The device shall be center bored and through bolted with a 1/4-inch minimum diameter steel shaft having a yield strength of 70,000 p.s.i. or more, with eyes at each end for attaching pulling cables. The eye shall be suitably backed with flange or heavy washer; a pull exerted on opposite end of shaft shall produce compression throughout remote end of ball, cylinder, or circular section. Circular sections shall be spaced so the distance from external faces of front and back sections shall equal or exceed diameter of circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through by hand or by being flushed through with water, shall be cause for rejection of a run. When a deflection device is used for the test in lieu of a ball, cylinder, or circular sections described, such device shall be given acceptance prior to use. Device shall be sensitive to 1.0% of pipe diameter being measured and shall be accurate to 1.0% of the indicated dimension. Installed pipe showing deflections greater than 5% of normal pipe diameter shall be retested by a run from the opposite direction. If retest also fails, the suspect pipe shall be repaired or replaced at no cost to Owner.
- C. 50% of pipes under roadways shall be televised and video recorded. The video observation shall include a complete pan view of each joint. If the video observation indicates problems, further televising may be required. Additional televising and video recording will be at no additional cost to the Owner.

3.10 DRAINAGE STRUCTURES

- A. Drainage structures shall be constructed of materials specified for each type and in accordance with details shown on the drawings.

3.11 REMOVE AND REPLACE PAVEMENT

- A. Pavement shall only be removed after prior written authorization by the Owner. Pavement removed and replaced shall be constructed in accordance with latest specifications of the State Department of Transportation. Traffic shall be maintained and controlled per State Department of Transportation regulations.

3.12 CONNECT PIPE TO EXISTING STRUCTURES

OMITTED

END OF SECTION

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SECTION 02731
WASTEWATER COLLECTION SYSTEM

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Sewer Pipes.
- B. Manholes.
- C. Connect to existing system.
- D. All necessary appurtenances to collect the wastewater and deliver it to the existing system.
- E. Pumping Station
- F. Force Main

1.2 RELATED SECTIONS

- A. Section 02204 – Earthwork.
- B. Section 02667 – Water Distribution System.

1.3 OPTIONS

- A. The specifications describe several materials. The Owner will select ones to be used. Where manufacturers and models of equipment are named in the specifications, it is intended these are to describe quality and function required. Contractor may use equipment or materials of other manufacturers provided they are reviewed and accepted by the Engineer and Owner as equivalent to those specified.

1.4 REFERENCES (Latest Revision)

- A. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.
- C. ASTM D 3034 – Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- D. ASTM D 2321 – Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- E. ANSI/AWWA C 150/A 21.50 – Thickness Design of Ductile Iron Pipe.

- F. ANSI/AWWA C 151/A 21.51 – Ductile Iron Pipe, Centrifugally Cast, for Water, or other liquids.
- G. ASTM A 746 – Ductile Iron Gravity Sewer Pipe.
- H. ASTM D 3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- I. ASTM F 477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- J. ASTM D 2241 – Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- K. ASTM D 3139 – Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- L. ASTM A 139 – Electric-Fusion (Arc) Welded Steel Pipe (NPS 4 and Over).
- M. ASTM C 478 – Precast Reinforced Concrete Manhole Sections.
- N. ASTM C 443 – Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
- O. ACI 318 – Building Code Requirements for Structural Concrete.
- P. ASTM C 39/C 39M – Compressive Strength of Cylindrical Concrete Specimens.
- Q. ASTM C 890 – Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
- R. ASTM C 891 – Installation of Underground Precast Concrete Utility Structures.
- S. ASTM C 913 – Precast Concrete Water and Wastewater Structures.
- T. ASTM A 615/A 615 M – Deformed and Plain Carbon – Steel Bars for Concrete Reinforcement.
- U. ANSI/AWWA C-500 – Metal-Seated Gate Valves for Water Supply Service.
- V. ANSI/AWWA C-509 – Resilient-Seated Gate Valves for Water Supply Service.
- W. ASTM D-6938 – In-Place Density and Water Content of Soil and Soil-Aggregate By Nuclear Methods (Shallow Depth).
- X. ASTM D-1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort.
- Y. ASTM D 714 – Evaluating Degree of Blistering of Paints.
- Z. ASTM D 2794 – Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- AA. ASTM E 96 – Water Vapor Transmission of Materials.

- BB. ASTM G 154 – Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.
- CC. ANSI/AWWA C 111/A 21.11 – Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
- DD. ASTM A 377 – Index of Specifications for Ductile Iron Pressure Pipe.
- EE. ANSI/AWWA C 600 – Installation of Ductile Iron Water Mains and their appurtenances.
- FF. ANSI/AWWA C115/A21.15 – Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges.
- GG. ASTM D 2774 – Underground Installation of Thermoplastic Pressure Piping.
- HH. ASTM F 1417 – Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.
- II. ANSI/AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 Inches through 12 inches, for Water Transmission and Distribution.
- JJ. ANSI/AWWA C905 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 Inches through 48 inches, for Water Transmission and Distribution.

1.5 MEASUREMENT AND PAYMENT

- A. Measurement – Items listed in the proposal shall be considered as sufficient to complete work in accordance with plans and specifications. Any portion of work not listed in the bid form shall be deemed to be a part of item it is associated with and shall be included in costs of unit shown on bid form. Payment for unit shown on the bid form shall be considered satisfactory to cover cost of all labor, material, equipment, and performance of all operations necessary to complete work in place. The unit of measurement shall be unit shown on bid form. Payment shall be based upon the actual quantity multiplied by unit prices. Where work is to be performed at a lump sum price, the lump sum shall include all operations and elements necessary to complete work.
- B. Payment
 - 1. Gravity Sewer Pipe – Measurements will be made between the centers of manholes or to other pipe ends. No deduction will be made for the space occupied by fittings. Payment will be made at the contract unit price per linear foot for each pipe size at various depths of cut. Depths of cut are measured from existing ground unless otherwise noted. Payment will include cost of pipe, plugs, dewatering, excavating all material, testing, backfilling, compaction, cleaning, metal detector tape, tracing wire, and all work necessary to complete the sewer lines.
 - 2. Trench Wall Supports – No separate payment will be made for bracing and sheeting.

3. Manholes – Payment for manholes will be made at the unit price for various types and depths. Manhole depths are measured from invert to proposed finish grade unless otherwise noted. Payment shall include cost of excavating, dewatering, constructing manholes in accordance with plans, furnishing and installing a frame and cover, steps, interior and exterior coatings, pipe connectors, backfilling, and compacting material around the manhole.
4. Service Connection – Payment will be made at the contract unit price. Payment shall include the fitting, plug, and marking stake.
5. Metal Detector Tape – No separate payment will be made for tape. Cost of furnishing and placing metal detector tape shall be included in the contract unit price for installing sewer and force main pipe.
6. Tracing Wire – No separate payment will be made for wire. The cost of furnishing and placing tracing wire shall be included in the contract unit price for installing force main pipe, [sanitary sewer, and service laterals.]
7. Laterals – Shall be measured from center of main to the point where lateral reaches property line. Payment will include furnishing the pipe, excavation, installation, metal detector tape, tracing wire, backfilling, compaction, and all work and materials necessary to complete laterals.
8. Grassing – There will be no separate measurement or payment. Grassing shall be a subsidiary obligation of Contractor in the restoration of disturbed areas.
9. Remove and Replace Existing Pavement – Payment will be made on a square yard basis, and in accordance with the detail shown.
10. Pumping Stations – All work except the force main covered in this subsection will be paid for under lump sum item for Pumping Station. Work described in other sections necessary to make Pumping Station complete will also be included in the lump sum payment. Such work will include dewatering, excavation, backfilling, compaction, site preparation, access road, fencing, grassing, potable water system, electrical, hoist system, standby generator, and clean-up.
11. Force Mains – Shall be paid for at the contract unit price for various sizes. Payment will include the pipe, fittings, thrust blocking, restrained joints, excavation, backfilling, compaction, testing, grassing, metal detector tape, tracing wire, and clean-up.
12. Air Release Valve and Manhole – Payment will be made at the contract unit price and will include furnishing and installing valve and manhole, backfilling, compacting, grassing, and clean-up.
13. Plug, Check & Gate Valves – Payment will be made at the contract unit price and will include furnishing and installing valve, valve box or manhole, backfilling, compacting, grassing, and clean-up.

14. Connect Sewers to Existing Structures – Payment will be made at the contract unit price for each pipe size connected. For precast structures payment shall include cost of dewatering, excavation, coring, furnishing and installing flexible sleeve, installing and connecting pipe to sleeve, backfilling, compaction, clean-up, and all work necessary to complete the connection. For brick structures, payment shall include cost of dewatering, excavation, cutting a hole, installing and grouting in pipe, backfilling, compaction, cleanup, and all work necessary to complete the connection.

1.6 QUALITY ASSURANCE

- A. Contractor will furnish the Engineer and Owner a description of all material before ordering. Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Where ductile iron pipe is indicated on the plans, or required by Engineer, it shall be used.
- C. Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of two years and provides published data on their quality and performance.
- D. A subcontractor for any part of the work must have experience on similar work, and if required, furnish Engineer with a list of projects and Owners or Engineers who are familiar with its competence.
- E. If Contractor wishes to furnish devices, equipment, structures, and systems not designed by Engineer, these items shall be designed by either a Professional Engineer registered in the project state or by someone Engineer accepts as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.
- F. Testing shall be by a testing laboratory which operates in accordance to ASTM D 3740 or E 329 and shall be acceptable to Engineer prior to engagement. Mill certificates of tests on materials made by manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests, spot checked by an outside laboratory, and furnishes satisfactory certificates with name of entity making test.
- G. Infiltration, line and grade of sewer, pump performance, and hydrostatic tests on force mains shall be made by Contractor with equipment qualified by Engineer and in the presence of Engineer. Engineer or Project Representative reserves the right to accept or reject testing equipment.

1.7 PRODUCT DELIVERY, STORAGE & HANDLING

- A. Material shall be unloaded in a manner avoiding damage and shall be stored where it will be protected and will not be hazardous to traffic. If stored on private property, Contractor shall obtain permission from property owner and shall repair any damage caused by the storage. Material shall be examined before

installation. Neither damaged nor deteriorated material shall be used in the work.

1.8 JOB CONDITIONS

- A. Installation of the wastewater collection system must be coordinated with other work on site. Generally, wastewater pipes will be installed first and shall be backfilled and protected so subsequent excavating and backfilling of other utilities does not disturb them. Contractor shall replace or repair any damaged pipe or structure at no additional expense to the Owner.

1.9 SEQUENCING AND SCHEDULING

- A. Contractor shall arrange the work so sections of sewers between manholes are backfilled and tested, lateral sewers connected, pavement replaced, and placed in service as soon as reasonable after installation.

1.10 ALTERNATIVES

- A. The intention of these specifications is to produce the best system for the Owner. If the Contractor suggests alternate material, equipment or procedures will improve results at no additional cost, Engineer and Owner will examine suggestion, and if accepted, it may be used. The basis upon which acceptance of an alternate will be given is its value to Owner, and not for Contractor's convenience.

1.11 GUARANTEE

- A. Contractor shall guarantee quality of materials, equipment, and workmanship for 12 months after acceptance of the completed Project. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

1.12 EXISTING UTILITIES

- A. All known utility facilities are shown schematically on the construction drawings, and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown will not relieve the Contractor of responsibility under this requirement. "Existing Utilities Facilities" means any utility existing on the project in its original, relocated, or newly installed position. Contractor will be held responsible for cost of repairs to damaged underground facilities, even when such facilities are not shown on the drawings.
- B. The Contractor shall call for underground utility locations before starting work. Underground utilities location service can be contacted at 1-888-721-7877 (SC).

1.13 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).
- B. In place density tests in accordance with ASTM D 2922.

- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours notice prior to taking any tests.
- E. Owner shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all tests shall be by the Owner, except Owner specifically reserves right to deduct from Contractor's payment, expenses and charges of testing laboratory when:
1. Contractor gives notice work is ready for inspection and testing, and fails to be ready for the test, and/or
 2. Testing of the Contractor's work, products, or materials fail, and retesting is required, and/or
 3. Contractor abuses services or interferes with work of the testing laboratory in conduct of this work.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

Materials used in the work shall be those named in Bid Form. In multiple type bids, selection of material types will be at the opinion of Owner. Materials and products used shall conform to one of the following:

2.1 SEWER PIPE

- A. PVC Pipe – Shall be polyvinyl chloride plastic (PVC) and shall meet all requirements of ASTM D 3034 SDR 26, except for depths less than 3 feet where ductile iron pipe must be installed. All pipe shall be suitable for use as a gravity sewer conduit. Provisions must be made for contraction and expansion at each joint with a rubber gasket. Pipe sizes and dimensions shall be as shown below. All pipe shall be green or white in color with factory marked homing lines. Fittings shall meet the same specification requirements as pipe.

Nom. Size	Outside Diameter		Min. Wall Thickness
	Average	Tolerance	SDR-26
4	4.215	± 0.009	.162
6	6.275	± 0.011	.241
8	8.400	± 0.012	.323
10	10.500	± 0.015	.404
12	12.500	± 0.018	.481

Tests on PVC Pipe – Pipe shall be designed to pass all tests at 73 ° F. (± 3° F.).

- B. Ductile Iron – Shall conform to ANSI A 21.50 (AWWA C 150), ANSI A 21.51 (AWWA C 151) and ASTM A 746. All pipe shall be Pressure Class 350 unless otherwise noted. All ductile iron pipes and fittings shall be bituminous coated on the outside and lined with Protecto 401 Ceramic Epoxy or equivalent on inside.
1. Coating on the outside shall be an asphaltic coating approximately 1 mil thick. Finished coating shall be continuous, smooth, neither brittle when cold or sticky when exposed to sun, and shall be strongly adherent to the iron.
 2. Protecto 401 Ceramic Epoxy or equivalent interior lining shall conform to ASTM E 96, ASTM D 714, ASTM D 2794 and ASTM G 53. Interior of the pipe shall receive 40 mils nominal dry film thickness of epoxy. Lining application, inspection, certification, handling, and surface preparation of area to receive the protective coating shall be in accordance with manufacturer's specifications and requirements.

2.2 JOINTS – GRAVITY SYSTEM

- A. Joints for Ductile Iron Pipe – Shall be slip-on rubber equivalent to "Fastite," "All-tite," or "Tyton."
- B. Joints for PVC Pipe – Shall be integral wall bell and spigot with a rubber ring gasket. Joints shall conform to ASTM D 3212 and gaskets to ASTM F 477.

2.3 FORCE MAIN

- A. P.V.C. – All pipe shall be green in color with factory marked homing lines. Pipe with diameter less than 4 inches shall conform to all requirements of ASTM D 2241, SDR 26, Class 160. Pipe 4 inches through 12 inches shall conform to all requirements of AWWA C900, DR 25, Pressure Class of 165 p.s.i. Pipe 14 inches through 18-inches shall conform to all requirements of AWWA C905 with C1 outside diameter, DR 25, with a pressure rating of 165 p.s.i. Joints shall be in accordance with ASTM D 3139.
- B. Ductile Iron pipe shall be in accordance with Paragraph 2.1-B and conform to ASTM A 377. Push-on-Joints shall be slip-on rubber equivalent to "Fastite," "All-tite," or "Tyton." Flanged joints shall conform to AWWA C 115. Gaskets shall conform to AWWA C 111.
- C. Thrust blocking shall be sized as detailed on the construction drawings of 3,000 p.s.i. concrete. Blocking shall be provided at all bends deflecting 11-1/4° degrees or more and bear directly against the undisturbed trench wall.
- D. Restrained Joints – Restrained joints for pipe, valves and fittings shall be mechanical joints with ductile iron retainer glands equivalent to "Megalug" or push-on type joints equivalent to "Lok-Ring," "TR Flex," or "Super Lock" and shall have a minimum rated working pressure equal to the item restrained with a minimum safety factor of 2:1. Joints shall be in accordance with the applicable portions of AWWA C-111. Manufacturer of joints shall furnish certification, witnessed by an independent laboratory, stating joints furnished have been

tested without signs of leakage or failure. Restrained joints shall be capable of being deflected after assembly.

2.4 CASING

- A. Casing pipe shall be steel conforming to ASTM A 139, yield point of 35,000 p.s.i., of the diameter shown on drawings at each crossing. The minimum wall thickness shall be 0.25 inches.

2.5 CASING SPACERS

- A. Casing spacers shall be bolt on style with a shell made in two sections of a minimum 14 gauge T-304 Stainless Steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner. All nuts and bolts shall be T-304 Stainless Steel. Runners shall be made of Ultra High Molecular Weight Polymer with inherently high abrasion resistance and a low coefficient of friction. The combined height of supports and runners shall keep carrier pipe a minimum of 0.75-inches from casing pipe at all times. Casing Spacers shall be as manufactured by Cascade Waterworks Manufacturing Company, or accepted equivalent.

2.6 MANHOLES

- A. Masonry – Shall be new whole brick of good quality laid in masonry mortar or cement mortar made of one part Portland cement and two parts clean sharp sand. Every brick shall be fully bedded in mortar. Manholes shall conform to locations and details shown on the plans.
- B. Precast Concrete – Shall be reinforced concrete constructed in accordance with ASTM C 478 and details shown on the plans "Precast Concrete Manholes." Coarse aggregate shall be granite stone. The joints shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or equivalent to Type A or B "Tylox" conforming to ASTM C 443. Mastic shall be equivalent to "Ram-nek" with primer. Primer shall be applied to all contact surfaces of manhole joint at the factory in accordance with manufacturer's instructions.
- C. Frames and Covers – Shall be cast iron equivalent to the following:

Neenah Foundry Co. R-1 668 Type "C" Lid
- D. Manhole Steps – Shall be equivalent to M.A. Industries, Type PS-1 or PS-2-PF. Steps shall be installed at the manhole factory and in accordance with recommendations of step manufacturer. Manholes will not be acceptable if steps are not installed accordingly.
- E. Pipe Connections – Shall have flexible watertight joints at sewer main point of entry into the manhole. The joint shall be an EPDM or polyisoprene sleeve equivalent to "Kor-N-Seal."
- F. Coatings – New manholes shall have all interior surfaces coated with a factory applied acrylic polymer-base coating and sealant. The coating shall be ConSeal

CS-55 manufactured by Concrete Sealants, New Carlisle, Ohio or an accepted equivalent. The coating shall be applied in three coats to achieve a total dry film thickness of at least 3.5 mils in accordance with manufacturer's recommendations. Surfaces shall be cleaned of all dust, form oils, curing compounds and other foreign matter prior to the coating application.

New or existing manholes requiring a force main tie-in and the next downstream manhole shall be coated with 125 wet film mils of Raven 405 ultra high build epoxy or an accepted equivalent. The interior surfaces shall be cleaned and prepared according to manufacturer's recommendations.

2.7 TEES

- A. Gravity sewer tees shall be four or six inches and same diameter as the run of pipe. They shall be of same material as the sewer main.

2.8 LATERALS

- A. Shall be Ductile Iron Pipe conforming to paragraph 2.1-B, with push-on joints or Polyvinyl Chloride pipe with bells and rubber gaskets for jointing, conforming, to Paragraph 2.1-A, PVC Pipe.

2.9 STONE BACKFILL

- A. Shall be graded crushed granite with the following gradation:

Square Opening Size	Percent Passing
1 inch	100%
3/4 inch	90 to 100%
3/8 inch	0 to 65%
No. 4	0 to 25%

2.10 SAND BACKFILL

- A. Shall be clean sand free from clay and organic material. Not more than 10% shall pass the No. 100 sieve.

2.11 BORROW

- A. Where it is determined sufficient suitable material is not available from the site to satisfactorily backfill pipe to at least two feet above top of pipe, Contractor shall furnish suitable sandy borrow material to accomplish requirements. Material shall not have more than 60% passing the No. 100 sieve, nor more than 20% passing a No. 200 sieve.

2.12 AIR RELEASE VALVE

- A. Shall be designed for sewage service. The valve shall be constructed of a cast iron body, stainless steel or bronze trim, and stainless steel float. The inlet shall be

2 inches, 5/16 inch orifice, and a venting capacity of 35 c.f.f.a.m. The working pressure shall be 0 to 50 p.s.i. It shall conform to detail shown on the drawings.

2.13 METAL DETECTOR TAPE

- A. Will be installed above all pipe. Tape shall consist of 0.35 mils thick solid foil core encased in a protective plastic jacket resistant to alkalis, acids, and other destructive elements found in the soil. The lamination bond shall be strong enough so layers cannot be separated by hand. Total composite thickness shall be 5.0 mils. Foil core to be visible from unprinted side to ensure continuity. The tape shall have a minimum 3 inch width and a tensile strength of 35 lbs. per inch.

A continuous warning message indicating "sewer line" repeated every 16 inches to 36 inches shall be imprinted on the tape surface. Tape shall contain an opaque color concentrate designating color code appropriate to the line being buried (Sewer Line – Green).

2.14 TRACING WIRE

- A. Will be used over all force main, [sanitary sewer and service lateral] lines. The wire will be #12 gauge insulated single strand copper wire.

2.15 SUBMERSIBLE SEWAGE PUMPING STATION

OMITTED.

2.16 CHECK VALVES

- A. Shall be designed for sewage service. The valve shall be cast iron and bronze fitted. The valve shall be a spring and lever type with neoprene seat and O-Ring seals on a stainless steel valve pin, for pipes 3 inches and larger in diameter. For check valves smaller than 3 inches, the valve shall be a fully ported 150 p.s.i. rated ball check valve with a corrosion resistant phenolic base and a rubber seat. Check valve shall be of full waterway design for quiet operation and with a flow area through the valve equal to or exceeding flow area of pipe to which it is installed.

2.17 GATE VALVES

- A. Two Inches and Larger – Shall be cast iron or ductile iron body, bronze mounted, double disc or resilient wedge design, with non-rising stems, conforming to AWWA C 500, C 509, or C 515. Valves shall have ends to match the pipe to which they are attached. Attachment to plastic pipe shall be made by special adapters. Valves shall have a working pressure of 200 p.s.i. and be tested at 400 p.s.i.

Valves shall be furnished with "O" ring packing. One "O" ring shall be located above the thrust collar and one below. Thrust collar shall be permanently lubricated and have an anti-friction washer on top of the thrust collar.

- B. Smaller Than 2 inches – Shall be all brass, ball valve type. The pressure rating shall be 175 p.s.i.

- C. Valve Boxes – Underground valves shall be installed in acceptable valve boxes. Valve boxes shall have a suitable base which does not damage valve or pipe, and shaft extension sections to cover and protect the valve and permit easy access and operation. The box, cover, and extensions shall be cast or ductile iron having a crushing strength of 1,500 pounds per linear foot.

2.18 PLUG VALVES

- A. Shall be fully ported and of the same diameter as pipes to which they are attached. They shall have semi-steel bodies, all metal plugs, stainless steel bearings, and be equivalent to DeZurik Series 100 eccentric valves, lever operated. All valves 6 inches and larger shall be equipped with gear actuator and handwheel.

2.19 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products before they are ordered by Contractor.

PART 3 – EXECUTION

3.1 CONSTRUCTION OBSERVATION

- A. The line, grade, deflection, and infiltration of sewers shall be tested by Contractor under the direction of Engineer. Engineer or Project Representative will have the right to require any portion of work be completed in their presence. If work is covered up after such instruction, it shall be exposed by Contractor for observation. However, if Contractor notifies Engineer such work is scheduled and Engineer fails to appear within 48 hours, the Contractor may proceed. All work completed and materials furnished shall be subject to review by the Engineer or Project Representative. All improper work shall be reconstructed. All materials not conforming to requirements of specifications shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Project Engineer or Project Representative a minimum of 48 hours notice for all required observations or tests.

It will also be required by Contractor to keep accurate, legible records of the location of all sanitary lines, service laterals, manholes, force mains, valves, bends, and appurtenances. These records will be prepared in accordance with "Record Data and Drawings" paragraph in the Special Conditions. Final payment to the Contractor will be withheld until all such information is received and accepted.

3.2 LOCATION AND GRADE

- A. Line and grade of sewers and position of all manholes and other structures are shown on the drawings. Grade line as given on the profile or mentioned in these

specifications means invert or inside bottom of pipe. Price for trenching shall include trench for depth below this line necessary to lay sewer to grade, but measurements for payment will be made only to grade line. Master control lines and bench marks have been provided by the Engineer. The Contractor shall be responsible for proper locations and grades of sewers.

3.3 SEWER EXCAVATION

- A. Contractor shall perform all excavations of every description and of whatever substance encountered to the depth shown on the plans or specified for all sewers, manholes, and other appurtenances. All excavations shall be properly dewatered before installations are made, by the use of well points, pumping, or other methods accepted by Engineer. Trenches shall be excavated in conformance with the Occupational and Safety Health Administration's (OSHA) Regulations.

Where the character of soil is unsuitable for pipe bedding as determined by Engineer or Geotechnical Consultant, additional excavation will be authorized. Engineer or Geotechnical Consultant shall determine the depth needed for additional bedding and whether material will be sand or stone. The unsuitable material shall be disposed of at Contractor's expense in a proper manner. Bottom of all trenches shall be rounded to conform to the bottom of pipe, to afford full bearing on pipe barrel. Excavation in excess of depths and widths required for sewers, manholes, and other structures shall be corrected by pouring subfoundations of 3,000 p.s.i. concrete and half cradle at the Contractor's expense.

- B. Trenches shall not be excavated more than 400 feet in advance of pipe laying.

3.4 TRENCH WALL SUPPORT

- A. Bracing and Sheeting – The sides of all trenches shall be securely held by stay bracing, or by skeleton or solid sheeting and bracing, as required by soil conditions encountered, to protect adjoining property and for safety. Where shown on drawings or where directed by Engineer, the Contractor must install solid sheeting to protect adjacent property and utilities. Sheeting shall be steel or timber and Contractor shall submit design data, including the section modulus of members and arrangement for bracing at various depths, to Engineer for review before installing sheeting. It shall penetrate at least 3-feet below the pipe invert. Contractor shall ensure support of pipe and its embedment is maintained throughout installation and ensure sheeting is sufficiently tight to prevent washing out of the trench wall from behind sheeting.
- B. Sheeting Removal – Sheeting shall be removed in units and only when backfilling elevation has reached the level necessary to protect pipe, adjoining property, personnel, and utilities. Removal of sheeting or shoring shall be accomplished in a manner to preclude loss of foundation support and embedment materials. Fill voids left on removal of sheeting or shoring and compact all materials to required densities.
- C. Movable Trench Wall Supports – Do not disturb installed pipe and its embedment when using movable trench boxes and shields. Movable supports should not be

used below top of pipe zone unless acceptable methods are used for maintaining the integrity of embedment material. Before moving supports, place and compact embedment to sufficient depths to ensure protection of the pipe. As supports are moved, finish placing and compacting embedment.

- D. When sheeting or shoring cannot be safely removed, it shall be left in place. Sheeting left in place shall be cut off at least 2 feet below the surface. No separate payment shall be made for bracing and sheeting except where shown on drawings or authorized by the Engineer.

3.5 LAYING PIPE

- A. All sewer pipe shall be laid upgrade with spigots pointing downgrade and in accordance with ASTM D 2321. The pipe shall be laid in a ditch prepared in accordance with Paragraph 3.3 "Sewer Excavation." When sewer is complete, the interior surface shall conform on bottom accurately to grades and alignment fixed or given by Engineer. Special care shall be taken to provide a firm bedding in good material, select borrow, stone backfill or 3,000 p.s.i. concrete, as authorized, for length of each joint and 1/2 of the circumference. Holes shall be provided to relieve bells from bedding strain, but not so large to allow separation of the bell from barrel by settlement after backfilling. All pipe shall be cleaned out, and left clean. Every third joint shall be filled around immediately after being properly placed.
- B. Jointing – Comply with manufacturer's recommendations for assembly of joint components, lubrication, and making joints. When pipe laying is interrupted, secure piping against movement and seal open ends to prevent the entrance of water, mud, or foreign material.
- C. Placing and Compacting Pipe Embedment – Place embedment materials by methods which will not disturb or damage the pipe. Work in and tamp haunching material in area between the bedding and underside of pipe before placing and compacting remainder of embedment in pipe zone. Do not permit compaction equipment to contact and damage the pipe. Use compaction equipment and techniques compatible with materials used and location in the trench. Before using heavy compaction or construction equipment directly over the pipe, place sufficient backfill to prevent damage, excessive deflections, or other disturbance of the pipe.
- D. Rock or Unyielding Materials in Trench Bottom – If ledge rock, hard pan, shale, or other unyielding material, cobbles, rubble, debris, boulders, or stones larger than 1.5-inches are encountered in the trench bottom, excavate a minimum depth of 6-inches below pipe bottom and replace with proper embedment material.
- E. Vertical Risers – Provide support for vertical risers as commonly found at service connections, cleanouts, and drop manholes to preclude vertical or lateral movement. Prevent the direct transfer of thrust due to surface loads and settlement, and ensure adequate support at points of connection to main lines.
- F. Exposing Pipe for Making Service Line Connections – When excavating for a service line connection, excavate material from above the top of main line

before removing material from sides of pipe. Materials and density of service line embedment shall conform to specifications for the main line.

- G. Manhole Connections – Use flexible water stops, resilient connectors, or other flexible systems acceptable to the Engineer making watertight connections to manholes and other structures.
- H. Jacking and Boring – Steel casing of diameter shown on the plans shall be jacked and bored in location indicated. Joints between sections of the steel casing shall be of a continuous weld made by a certified welder. Jacking and boring shall be in accordance with South Carolina Department of Transportation Standard Specifications. Carrier pipe shall be installed as shown on the detail. After carrier pipe has been installed, ends of the casing shall be sealed using a rubber enclosure and stainless steel straps or brick and mortar.

Where work involves a highway, a Resident Engineer of the State Department of Transportation shall be notified 3 days before crossing is started. Where work involves a railroad, the work shall conform to requirements of AREA specifications. Division Superintendent of the Railroad shall be notified 3 days prior to beginning work. Before commencing work within the right-of-way of railroads or highways, Contractor shall verify Owner has obtained required permits.

3.6 SEPARATION BETWEEN WATER & SANITARY SEWER

- A. Parallel Installation:
 - 1. Water mains shall be laid at least 10 feet horizontally from any existing or proposed sanitary sewer, storm sewer, or sewer manhole. The distance shall be measured edge-to-edge.
 - 2. When conditions prevent a horizontal separation of 10 feet, water main may be laid closer to a sewer (on a case-by-case basis) provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation where bottom of water main is at least 18 inches above top of sewer. It is advised the sewer be constructed of materials and with joints equivalent to water main standards of construction and be pressure tested to assure water-tightness prior to backfilling.
- B. Crossing:
 - 1. Water mains crossing house sewers, storm sewers, or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of water main and top of sewer. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.
 - 2. When conditions prevent a vertical separation of 18 inches, the sewer passing over or under water mains shall be constructed of materials and with joints equivalent to water main standards of construction and shall be pressure tested to assure water-tightness prior to backfilling.

3. When water mains cross under sewers, additional measures shall be taken by providing:
 - a. a vertical separation of at least 18 inches between bottom of the sewer and top of water main;
 - b. adequate structural support for sewers to prevent excessive deflection of joints settling on and breaking the water mains;
 - c. length of water pipe be centered at the point of crossing so joints will be equidistant and as far as possible from sewer; and
 - d. both sewer and water main shall be constructed of water pipe and subjected to hydrostatic tests, as prescribed in this document. Encasement of the water pipe in concrete shall also be considered.
 - e. crossings shall conform to South Carolina Department of Health and Environmental Control's Bureau of Water Standards for Wastewater Facility Construction: Regulation 61-67.

3.7 BACKFILLING

- A. All trenches and excavation shall be backfilled immediately after pipes are laid therein, unless other protection of the pipe line is directed. Backfilling material shall be selected and deposited with special reference to the future safety of pipes. Except where special methods of bedding and tamping are provided for, clean earth or sand shall be solidly tamped about pipe up to a level at least 2 feet above top of pipes, and shall be carefully deposited to uniform layers, each layer solidly tamped or rammed with proper tools to not injure or disturb the pipeline. Remainder of the trench backfilling shall be carried on simultaneously on both sides of pipe in such a manner preventing injurious side pressure. The material used shall be selected from excavations anywhere on site if any of this soil is suitable. Backfill material shall be clean and free of rock, organic and other deleterious matter.

Under traffic areas, the top 24 inches of backfill material shall be compacted to a density of not less than 98% of maximum laboratory density at optimum moisture. Below the 24 inch line and to and including area around pipe, density shall not be less than 95% of maximum laboratory density at optimum moisture. In non-traffic areas, the backfill material shall be compacted to a density of not less than 90% of maximum laboratory density at optimum moisture unless otherwise accepted by Engineer. Compaction tests shall be conducted in accordance with ASTM D 6938 by an independent testing laboratory. Tests are to be taken at the direction of Engineer.

Whenever trenches have not been properly backfilled, or if settlement occurs, they shall be refilled, smoothed off and finally made to conform to the ground surface. Backfilling shall be carefully performed, and original surface restored to the full satisfaction of Engineer immediately after installation.

Where thermoplastic (PVC) pipe is installed, Contractor shall take precautions in accordance with ASTM D 2321, during backfilling operations so not to create excessive side pressures, or vertical or horizontal deflection of the pipe nor impair flow capacity.

3.8 MANHOLES

- A. Manholes shall be constructed where shown on the drawings or where directed by Engineer. The channel in bottom of manholes shall be smooth and properly rounded. Special care must be exercised in laying the channel and adjacent pipes to grade. Manhole top elevations shall be greater than or equal to the 50 year flood elevation, unless watertight covers are provided. Tops of manholes outside of roads shall be built to grades 1-inch above ground surface in developed areas and 6 inches above ground surface in undeveloped areas unless otherwise shown on the plans. Manholes in roads shall be built to grades designated by the Engineer. Manhole sections with either honeycomb defects; exposed reinforcing; broken/fractured tongue or groove; or cracked walls will be subject to rejection by Engineer for use on the project. When mastic sealant is used, improperly applied primer will also be cause for rejection.

No leaks in any manhole will be acceptable. All repairs made from inside the manhole shall be made with mortar composed of one part Portland cement and two parts clean sand. The mixing liquid shall be straight bonding agent equivalent to "Acryl 60."

3.9 STONE BEDDING

- A. Where, in the Engineer's or Geotechnical Consultant's opinion, subgrade of pipe trench is unsuitable material, Contractor shall remove unsuitable material to a depth determined by Engineer or Geotechnical Consultant and furnish and place stone backfill in trench to stabilize subgrade. Presence of water does not necessarily mean stone backfill is required. If well points or other types of dewatering will remove the water, Contractor shall be required to completely dewater trench in lieu of stone backfill. Stone bedding will be limited to areas where well pointing and other conventional methods of dewatering will not produce a dry bottom. Stone shall be placed 4 feet wider than the outside diameter of pipe. The pipe shall be carefully bedded in stone as specified, or in accordance with manufacturer's recommendations.

3.10 SAND BEDDING

- A. Where, in the Engineer's or Geotechnical Consultant's opinion, character of soil is unsuitable for pipe bedding, even though dewatered, additional depth of excavation as determined by Engineer or Geotechnical Consultant shall be made and replaced with clean sand furnished by Contractor.

3.11 DEFLECTION

- A. It is the Contractor's responsibility to assure backfill is sufficient to limit pipe deflection to no more than 5%. When flexible pipe is used, a deflection test shall be made by Contractor on the entire length of installed pipeline, not less than 30-days after completion of all backfill and placement of any fill. Deflection shall be

determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 95% the inside pipe diameter. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface brinell hardness of not less than 150. The device shall be center bored and through bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of 70,000 p.s.i. or more, with eyes at each end for attaching pulling cables. The eye shall be suitably backed with flange or heavy washer; a pull exerted on opposite end of shaft shall produce compression throughout remote end of ball, cylinder, or circular section. Circular sections shall be spaced so distance from the external faces of front and back sections shall equal or exceed diameter of circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through by hand or by being flushed through with water, shall be cause for rejection of individual run. When a deflection device is used for the test in lieu of a ball, cylinder, or circular sections described, such device shall be acceptable to Engineer prior to use. Device shall be sensitive to 1.0% of diameter of pipe being measured and shall be accurate to 1.0% of indicated dimension. Installed pipe showing deflections greater than 5% of the normal diameter of pipe shall be retested by a run from opposite direction. If retest also fails, the suspect pipe shall be repaired or replaced at no cost to Owner.

3.12 LEAKAGE

- A. In no stretch of sewer between any two adjoining manholes shall infiltration/exfiltration exceed 25 gallons/day/inch of pipe diameter per mile of pipe. In case leakage exceeds this amount, the sewer shall not be accepted until such repairs and replacements are made to comply with above requirements. Such corrections will be made at the Contractor's expense. All visible leaks shall be repaired, regardless of the amount of leakage.
- B. Lines shall be tested for leakage by low pressure air testing, infiltration tests, or exfiltration tests, as appropriate. Low pressure air testing for PVC pipe shall be as prescribed in ASTM F 1417. Prior to infiltration or exfiltration tests, trench shall be backfilled up to at least the lower half of pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When water table is 2 feet or more above top of pipe at the upper end of pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to Engineer. When Engineer determines infiltration cannot be properly tested, an exfiltration test shall be made by filling the line to be tested with water so a head of at least 2 feet is provided above both water table and top of pipe at upper end of pipeline to be tested. The filled line shall be allowed to stand until pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be re-established. The amount of water required to maintain this water level during a 2 hour test period shall be measured. Leakage as measured by either the infiltration test or exfiltration test shall not exceed 25 gallons per inch diameter per mile of pipeline per day. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished.

Testing, correction, and retesting shall be made at no additional cost to the Owner.

- C. The Contractor shall furnish equipment and plugs and subject force mains to hydrostatic tests at 100 p.s.i. for a period of two hours. Any leaks shall be located and repaired. Each section tested shall be slowly filled with water, care being taken to expel all air from the pipes. No pipe installation will be accepted until leakage during pressure test is less than the number of gallons listed for each 1000-foot of pipe tested:

6 inches & less – 0.9 gallons	12 inches – 1.80 gallons
8 inches – 1.20 gallons	14 inches – 2.10 gallons
10 inches – 1.50 gallons	16 inches – 2.40 gallons

3.13 CLEANING AND ACCEPTANCE

- A. Before acceptance of sewer system, it shall be tested and cleaned to the satisfaction of Engineer. Where any obstruction is met, Contractor will be required to clean sewers by means of rod and swabs or other instruments. The pipe line shall be straight and show a uniform grade between manholes. The Engineer shall check lines by lamping or other methods to determine final acceptance.

3.14 CLOSING PIPE

- A. When work or pipe installation is suspended, either for the night or at other times, end of sewer must be closed with a tight cover. Contractor will be held responsible for keeping the sewer free from obstruction.

3.15 PARTIAL ACCEPTANCE OF THE WORK

- A. Owner reserves right to accept and use any part of the work. Engineer shall have power to direct on what line the Contractor shall work and order thereof.

3.16 GRASSING

- A. Grassing of areas disturbed during construction shall be in accordance with Section 02902 – “Grassing.”

3.17 RECORD DATA

- A. It will be required of the Contractor to keep accurate, legible records, locating all sewers, force mains, tees, and laterals. These records will be made available to Engineer before final review for incorporation into the Engineer's Record Drawings. Final payment to the Contractor will be withheld until all such information is received and accepted.

3.18 REMOVE AND REPLACE PAVEMENT

- A. Pavement shall only be removed after prior written authorization by the Owner. Pavement removed and replaced shall be constructed in accordance with latest specifications of the State Department of Transportation. Traffic shall be maintained and controlled per State Department of Transportation regulations.

Edges of the pavement shall be cut to a neat straight line with a masonry saw. Backfill shall be compacted and tested and a concrete base course of 5,000 p.s.i. placed on the fill as shown on details. The concrete base shall be placed within 24 hours after pipeline is installed. A temporary wearing surface may be used provided it presents a smooth surface. The final wearing surface shall be 2 inches or 12.5 mm, Type B asphaltic concrete.

3.19 METALLIC DETECTOR TAPE

- A. Contractor shall place metallic detector tape, suitably coded, directly over all installed pipes at a depth of 18 inches below the finished surface.

3.20 TRACING WIRE

- A. Tracing wire will be installed on all force mains, sanitary sewer and service laterals directly on top of the pipe. Wire shall be secured to the pipe with tape or other acceptable methods at spacings of no more than 36-inches apart. Where sections of wire are jointed together, the wire insulation shall be stripped so bare wires can be wrapped with a rubberized insulation tape. The insulated wire must maintain electrical continuity. This tracing wire system shall be checked and tested by the Contractor, in presence of Engineer or Owner prior to acceptance of force main [sanitary sewer and service laterals]. All equipment, meters, detectors, etc., needed for testing shall be furnished by the Contractor.

3.21 CONNECT SEWERS TO EXISTING STRUCTURES

- A. Contractor shall connect the system to existing structures where indicated. For brick structures, a hole not more than 4 inches larger than the outside diameter of new pipe shall be cut neatly in structure, new pipe laid so it is flush with inside face of structure, and annular space around pipe filled with a damp, expanding mortar or grout to make a watertight seal. For precast structures, core proper size hole in structure for pipe being connected, attach flexible sleeve into cored hole and connect new pipe into flexible sleeve with a stainless steel band.

3.22 FIELD QUALITY CONTROL

- A. Soil and density tests shall be made by a testing laboratory acceptable to the Engineer. Laboratory tests of the soil shall be made in accordance with ASTM D 1557. In-place density tests shall be made in accordance with ASTM D 6938. Results of the tests shall be furnished to the Engineer.

The minimum number of tests required shall be:

Backfill over sewer in traffic areas..... 1 per 100 linear feet or less for each 4 feet of depth or portion thereof.

Backfill over sewer in non-traffic areas... 1 per 500 linear feet or less for each 6 feet of depth or portion thereof.

3.23 AIR RELEASE VALVE

- A. The manhole and installation of valve shall be in accordance with detail on drawings. Prior to deciding on the location of any air release valve, Contractor shall provide Engineer with an accurate profile of installed force main so high points in system can be determined.

3.24 SEWAGE PUMPING STATION

OMITTED.

3.25 FORCE MAIN

OMITTED.

3.26 BYPASSING

- A. Bypassing of raw wastewater onto the ground or into a receiving stream is prohibited.
- B. Bypassing shall be accomplished with pumping equipment sufficient to maintain the flow of wastewater. Contractor shall provide pump, hoses, materials, and labor to operate and maintain the bypassing operation. A backup pump shall also be made available by the Contractor. Bypassing operations shall be reviewed and acceptable to the sewer system operator before being implemented.

END OF SECTION

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SECTION 02890 – TRAFFIC SIGNS

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Signs.
- B. Posts.
- C. Fabricating and installing traffic signs in accordance with details shown on construction plans and the Manual on Uniform Traffic Control Devices.

1.2 REFERENCES (LATEST REVISION)

- A. ASTM A 123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM A 153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM A 193 – Alloy-Steel and Stainless-Steel Bolting for High Temperature or High-Pressure Service and Other Special Purpose Applications.
- D. ASTM A 307 – Carbon Steel Bolts and Studs, 60,000-PSI Tensile Strength.
- E. ASTM A 615 – Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- F. ASTM B 209 – Aluminum and Aluminum-Alloy Sheet and Plate.
- G. ASTM B 211 – Aluminum and Aluminum-Alloy Bar, Rod, and Wire.

1.3 SUBMITTALS

- A. A sample of all signs and posts to be placed shall be submitted to the Engineer for review prior to ordering.

1.4 QUALITY ASSURANCE

- A. Material and equipment shall be the standard product of a manufacturer who has manufactured them for a minimum of 2-years and provides published data on quality and performance.

1.5 GUARANTEE

- A. Contractor shall guarantee the quality of materials and workmanship for a period of 12-months after acceptance. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

1.6 MEASUREMENT AND PAYMENT

- A. Payment for signs will include all necessary labor and materials to fabricate and install the sign. Payment will be made according to the contract unit price.

PART 2 – PRODUCTS

2.1 UNIFORMITY

- A. All signs shall be uniform in shape, color, dimensions, legends, and illumination or reflectorization.

2.2 MATERIALS AND WORKMANSHIP

- A. Signs: Shall be aluminum 0.08-inch minimum thickness and shall conform to ASTM B 209, Alloy 6061-T6 or 5053-H38. Finished sign shall be clear cut, the lines of all letters and details true, regular and free from waviness, unevenness, furry edges, or lines and shall be free from all scaling, cracking, blistering, pitting, dents, or blemishes of any kind.
- B. Sign Posts: Shall be galvanized steel flanged "U" channel section with a minimum (before punching or drilling) of two (2)-pounds per foot and shall conform to the minimum yield point and tensile strength specified in ASTM A 615 Grade 60. Galvanizing shall be in accordance with ASTM A 123. Length as specified on the plans. Holes may be punched or drilled 3/8-inch in diameter and spaced one (1)-inch center to center beginning one (1)-inch from the top and extending the full length of post.
- C. Hardware: Bolts shall be 5/16-inch diameter with hexagonal heads and of sufficient length to extend at least 1/4-inch beyond the nut when installed. Nuts shall be hex nuts of the self-locking plastic insert type. The thread fit for nuts shall be ANSI, Class 2B. The washers shall be flat and 25/64-inch ID by 3/4-inch OD by 0.091-inch thick. These washers are to be placed between head of bolt and sign face. Bolts, nuts, washers and spacers may be aluminum, stainless steel or galvanized steel. Galvanized steel bolts and washers shall conform to ASTM A 307, galvanized in accordance with ASTM A 153. Aluminum shall conform to ASTM B 211, Alloy 2024-T4 for bolts, Alloy 2017-T4 for nuts, and ASTM B 209, Alloy 2024-T4 for washers. Stainless steel shall conform to ASTM A 193, Type B8.

2.3 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. The Engineer will review all products before they are ordered.

PART 3 – EXECUTION

3.1 GENERAL

- A. Sign posts and their foundations and sign mountings shall be constructed to hold signs in a proper and permanent position, to resist swaying in the wind or displacement by vandalism.

3.2 LOCATION

- A. Signs are to be placed as shown on the plans. Signs shall conform to height and lateral locations as shown in the Manual on Uniform Traffic Control Devices.

3.3 ERECTION

- A. Drive type posts may either be driven in place or placed in prepared holes. Driven posts will be limited to locations where the surrounding soil is firm and stable. When sandy or unstable soils are present, each drive post shall be placed in a prepared dry hole minimum six (6) inches in diameter. Whenever posts are placed in prepared holes, the holes shall be backfilled with a mixture of Portland Cement and sand. The resultant mixture shall be mixed with water to a moist consistency and placed around posts. All posts shall be erected in a vertical and plumb position to a depth of three (3) feet and at an angle to the roadway as shown on plans or directed by Engineer.

END OF SECTION

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SECTION 02902

GRASSING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Seeding, planting grass, and fertilizing graded areas behind the structures, pipeline rights-of-way, roadway shoulders and other disturbed areas.
- B. Seed protection.
- C. Maintaining seeded areas until final acceptance.

1.2 RELATED WORK

- A. Civil and Landscape plans and specifications.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging, and location of packaging. Damaged packages are not acceptable. Store in cool, dry locations away from contaminants.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer. Damaged bags are not acceptable. Store in cool, dry locations away from contaminants.
- C. Deliver sod on pallets.
- D. All material shall be acceptable to Engineer prior to use.

1.4 PLANTING DATES

- A. This specification provides for establishment of a permanent grass cover between the dates of March 1 and September 30. If finished earth grades are not completed in time to permit planting and establishment of permanent grass during the favorable season between dates specified above unless otherwise accepted, Contractor will be required to plant a temporary cover to protect new graded areas from erosion and to keep windborne dust to a minimum. The temporary cover shall be planted between October 1 and February 28 unless otherwise permitted.

1.5 MEASUREMENT AND PAYMENT

- A. Measurement and payment for grassing shall be paid for in the contract unit price.

PART 2 – PRODUCTS

- A. Contractor shall submit source and species certification documents to Engineer and Owner's Representative for review prior to installation. Supply complete

information on all analysis/test methodologies and results; laboratory certifications, manufacturer's specifications, and agency approvals to the Landscape Architect/Project Engineer prior to placement of soil mixtures. In addition, provide the Landscape Architect/Project Engineer with thoroughly mixed sample of soil mixes for acceptance prior to placement. Landscape Contractor shall make modifications and improvements to soil mixes deemed necessary by the soil analysis to meet requirements specified here in before, and to ensure proper growing medium for plant material.

2.1 SEED

- A. All seed shall conform to State Laws and requirements and regulations of the State Department of Agriculture.
- B. The varieties of seed, as specified in Section 2.2, shall be individually packaged or bagged, and tagged to show name of seed, net weight, origin, germination, lot number, and other information required by the State Department of Agriculture.
- C. Engineer reserves the right to test, reject, or accept all seed before seeding.

2.2 SEEDING SCHEDULE

- A. See construction plans for seeding schedule.

2.3 FERTILIZER

- A. Commercial fertilizer of accepted type, conforming to State fertilizer laws at the rate as recommended by soils test.

2.4 LIME

- A. Agricultural grade, ground limestone at the rate as recommended by soils test.

2.5 SPRIG

OMITTED

2.6 SPRIGGING SCHEDULE

OMITTED

2.7 SOD

- A. Sod shall be premium grade, densely rooted, good quality grass of the species and certified variety as shown on the plans, free from noxious weeds with no surface soil being visible. The sod shall be obtained from areas where the soil is reasonably fertile. Sod of specified species shall be grown from seed or sprig with not less than 95-percent germination, 85-percent pure seed, and not more than 0.5-percent weed seed. The sod shall be machine cut to a uniform soil thickness that shall contain practically all of the dense root system and not be less than 1-inch thick.
- B. Before cutting, sod shall be mowed to a height of not less than 1-1/2-inches or

more than 2-inches. Sod shall be cut in minimum uniform widths of 12-inches and lengths of 24-inches.

- C. Sod shall be delivered to site in a fresh, moist condition with healthy green foliage. It shall be unloaded from delivery trucks on pallets or in rolls and placed in final position within 24-hours of delivery. Sod shall be protected from wind and sun and shall not be allowed to dry out before planting.
- D. Sod shall be strong enough to support its own weight and retain its size and shape when suspended vertically from a firm grasp on the upper 10-percent of the section.

2.8 ACCESSORIES

- A. Straw Mulch: Oat or wheat straw, reasonably free from weeds, foreign matter detrimental to plant life, and in dry condition.
- B. Excelsior Mulch: Excelsior mulch shall consist of wood fibers cut from sound, green timber. The average length of fibers shall be 4 to 6-inches. Cut shall be made in such a manner as to provide maximum strength of fiber, but at a slight angle to natural grain of the wood to cause splintering of fibers when weathering in order to provide adherence to each other and to soil.
- C. Wood cellulose fiber shall be made from wood chip particles manufactured particularly for discharging uniformly on the ground surface when dispersed by a hydraulic water sprayer. It shall remain in uniform suspension in water under agitation and blend with grass seed and fertilizer to form a homogenous slurry. Mulch fibers shall intertwine physically to form a strong moisture holding mat on the ground surface and allow rainfall to percolate into underlying soil. The mulch shall be heat processed to contain no germination or growth-inhibiting factors. It shall be dyed (non-toxic) an appropriate color to facilitate metering of material.

2.9 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. The Engineer will review all products before they are ordered.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Areas to be seeded shall be made smooth and uniform and shall conform to the finished grade indicated on plans.
- B. Remove foreign materials, plants, roots, stones, and debris from surfaces to be seeded.
- C. Grassing areas, if not loose, shall be loosened to a minimum depth of 3-inches before fertilizer, seed or sod is applied.
- D. Amendments to soils shall be incorporated into loosened 3-inch top soil layer as recommended by soils tests.

- E. Contractor shall provide Topsoil Analysis Tests performed by a State Agricultural Experiment Station, Soil and Water Conservation District, State University, or other qualified private testing laboratory, as acceptable to Landscape Architect/Project Engineer. Soils test shall identify existing pH and nutrient levels, as well as recommended adjustments based on the type of grass to be installed.

3.2 STAND OF GRASS

- A. Before acceptance of seeding, sodding, or sprigging is performed for the establishment of permanent vegetation, Contractor will be required to produce a satisfactory stand of perennial grass whose root system shall be developed sufficiently to survive dry periods and winter weather and be capable of re-establishment in spring.
- B. Before acceptance of seeding is performed for the establishment of temporary vegetation, Contractor will be required to produce a stand of grass sufficient to control erosion for a given area and length of time before the next phase of construction or establishment of permanent vegetation is to commence.

3.3 SEEDING DATES

- A. Seeding shall be performed during periods and at rates specified in their respective schedules. Seeding work may, at discretion of Contractor, be performed throughout the year using schedule prescribed for given period. Seeding work shall not be conducted when the ground is frozen or excessively wet. Contractor will be required to produce a satisfactory stand of grass regardless of the period of year work is performed.

3.4 APPLYING LIME AND FERTILIZER

- A. Following advance preparation and placing selected material for shoulders and slopes, lime and fertilizer, if called for based on soil tests, shall be spread uniformly over the designated areas, and shall be thoroughly mixed with the soil to a depth of approximately 2-inches. Fertilizer and lime shall be applied at the rate recommended by required soils test. Unless otherwise provided, lime will not be applied for temporary seeding. In all cases where practicable, acceptable mechanical spreaders shall be used for spreading fertilizer. On steep slopes subject to slides and inaccessible to power equipment, the slopes shall be adequately scarified. Fertilizer may be applied on steep slopes by hydraulic methods as a mixture of fertilizer and seed. When fertilizer is applied with combination seed and fertilizer drills, no further incorporation will be necessary. The fertilizer and seed shall be applied together when Wood Cellulose Fiber Mulch is used. Any stones larger than 2-1/2-inches in any dimension, larger clods, roots, or other debris brought to the surface shall be removed.

3.5 SEEDING

- A. Seed shall be sown within 24-hours following application of fertilizer and lime and preparation of the seedbed as specified in Section 3.4. Seed shall be uniformly sown at rate specified by the use of acceptable mechanical seed drills. Rotary hand seeders, power sprayers or other satisfactory equipment may be used on steep slopes or on other areas inaccessible to seed drills.

- B. Seeds shall be covered and lightly compacted by means of cultipacker or light roller if the drill does not perform this operation. On slopes inaccessible to compaction equipment, the seed shall be covered by dragging spiked chains, by light harrowing or by other satisfactory methods.
- C. Apply water with fine spray immediately after each area has been sown.
- D. Do not sow seed when ground is too dry, during windy periods or immediately following a rain.
- E. If permitted by the special provisions, wood cellulose fiber mulch or excelsior fiber mulch may be used.

3.6 SEED PROTECTION (STRAW MULCH)

- A. All seeded areas seeded with permanent grasses shall be uniformly mulched in a continuous blanket immediately following seeding and compacting operations, using at least 2-tons of straw per acre.

3.7 SEED PROTECTION (EXCELSIOR MULCH)

- A. Seed shall be sown as specified in Section 3.5. Within 24-hours after covering of seed, excelsior mulch shall be uniformly applied at the rate of 2-tons per acre. The mulch may be applied hydraulically or by other acceptable methods. Should the mulch be placed in a dry condition, it shall be thoroughly wetted immediately after placing. Engineer may require light rolling of the mulch to form a tight mat.

3.8 SEED PROTECTION (WOOD CELLULOSE FIBER MULCH)

- A. After the lime has been applied and ground prepared as specified in Section 3.4, wood cellulose fiber mulch shall be applied at a rate of 1,500-pounds per acre in a mixture of seed and fertilizer. Hydraulic equipment shall be used for application of fertilizer, seed, and slurry of the prepared wood pulp. This equipment shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry of the specified amount of fiber, fertilizer, seed, and water. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of hydraulic spray nozzles which will provide an even distribution of slurry on various areas to be seeded. The slurry tank shall have a minimum capacity of 1,000-gallons.

Seed, fertilizer, wood pulp mulch, and water shall all be combined into the slurry tank for distribution of all ingredients in one operation by hydraulic seeding method specified herein. Materials shall be combined in a manner recommended by the manufacturer. The slurry mixture shall be regulated so amounts and rates of application shall result in a uniform application of all materials at rates not less than amount specified. Using the color of wood pulp as a guide, equipment operator shall spray prepared seedbed with a uniform visible coat. The slurry shall be applied in a sweeping motion, in an arched stream to fall like rain, allowing wood fibers to build upon each other until an even coat is achieved.

3.9 SPRIGGING

OMMITED

3.10 SODDING

- A. Sod shall be placed between March 1st and December 1st. However, if sod is to be placed during periods of temperatures over 90 degrees F., the Contractor shall take extra care for quick placement of sod with adequate, consistent watering necessary to ensure sod thrives as planted.
- B. Sod shall be placed within 24-hours of cutting.
- C. Place top elevation of sod ½-inch below adjoining paving or curbs.
- D. All areas to be sodded shall be brought to the proper line grade or cross section as was existing prior to construction. Sod shall be placed so, upon completion, edges of sodded areas will be smooth and will conform to the proposed finished grade. Sod shall be laid smooth, edge to edge, with staggered joints. Sod shall be immediately pressed firmly into contact with the sod bed by tamping or rolling, to eliminate any air pockets. A true and even surface shall be provided, to insure knitting without displacement of the sod or deformation of the sodded areas surfaces. Do not stretch or overlap sod pieces. Following compaction, screened soil of good quality shall be used to fill all cracks. Excess soil shall be worked into the grass with rakes or other suitable equipment. On slopes steeper than 3 to 1, sod shall be fastened in place with suitable wood or metal pins to hold the sod in place. Any damage by erosion or other causes occurring after completion of grading operations shall be repaired, before commencing with the sodding operations.
- E. Immediately before sodding, moisten topsoil with a fine spray to a minimum 1-inch depth. Sod shall not be laid on dry or powdery soil.
- F. Sod shall be moist when laid and placed on moist ground. The sod shall be carefully placed by hand, beginning at the toe of slopes and working upwards. The length of strips shall be at right angles to flow of surface water. All joints shall be tightly butted, and end joints shall be staggered at least 12-inches. Sod shall be immediately pressed firmly into the ground by tamping or rolling. Fill all joints between strips with fine screened soil. Sod on slopes shall be pegged with sod pegs to prevent movement.
- G. Within two hours after sod has been placed, thoroughly water to a minimum depth of 4-inches. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove depressions and irregularities. Roll sodded areas with a roller not exceeding 150 lbs. per foot of roller width.

PART 4 – MAINTENANCE, WARRANTY AND ACCEPTANCE

4.1 MAINTENANCE

- A. Maintain grassed surfaces until final acceptance.
- B. Maintenance shall consist of providing protection against traffic, watering to ensure uniform seed germination and to keep surface of soil damp, and repairing any areas damaged as a result of construction operations or erosion. Maintenance shall also include, but is not limited to, watering, weeding, cultivating, removal of dead material, lawn mowing, fertilizing, and other necessary operations.

- C. The Contractor shall maintain all proposed plantings until the date of substantial completion issued by the Owner.

4.2 WARRANTY

- A. All grassed areas shall be guaranteed by Contractor to be alive and healthy for a one (1) year period from date of substantial completion issued by the Owner. A final walk through with the Owner shall be conducted at end of warranty period to determine if any areas require replanting. At end of warranty period, sod shall show evidence of rooting to underlying soil and shall have no competitive weed growth from either the sod or from between sod joints.
- B. Any grassed area which is dead or not showing satisfactory growth shall be replaced at Contractor's expense at the end of warranty period. All replacement shall be of original quality. Replacement required because of vandalism, excessive use, or other causes beyond the control of Contractor are not part of this contract.

4.3 ACCEPTANCE

- A. Before acceptance of seeding performed for the establishment of permanent vegetation, Contractor will be required to produce a satisfactory stand of perennial grass whose root system shall be developed sufficiently to survive dry periods and winter weather and be capable of reestablishment in spring.
- B. A minimum coverage of 80% density over 100% of the disturbed area is required for seeded areas before project acceptance. Sprig and sod areas shall have 95% coverage over 100% of the disturbed area prior project acceptance.

END OF SECTION



**CONTRACT DOCUMENTS
AND
TECHNICAL SPECIFICATIONS
FOR THE
ACCESS ROAD EXTENSION
PHASE 1**

APPENDIX A

REPORT OF SUBSURFACE EXPLORATION
SALUDA COMMERCE PARK – ACCESS ROAD

J – 27706.0003

NOVEMBER 2024



Report of Subsurface Exploration
Saluda Commerce Park – Access Road
Saluda, South Carolina
S&ME Project No. 24610251

PREPARED FOR:

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PREPARED BY:

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June 20, 2024



June 20, 2024

Thomas & Hutton
1501 Main Street, Suite 400
Columbia, South Carolina 29201

Attention: Ms. Allison Busch

Reference: **Report of Subsurface Exploration**
Saluda Commerce Park – Access Road
Saluda, South Carolina
S&ME Project No. 24610251

Dear Ms. Busch:

As requested, S&ME, Inc. (S&ME) has completed field and laboratory testing for the above referenced site, located in Saluda, South Carolina. Our work was performed in general accordance with S&ME Proposal Number 24610251, dated May 9, 2024.

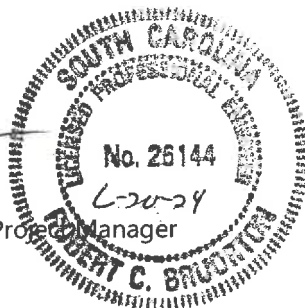
This report provides information on the exploration and testing procedures used, our boring records, our laboratory test results and our conclusions regarding site and subsurface conditions. This report also provides our recommendations regarding site preparation, dewatering considerations (if necessary), excavation considerations, slope considerations, suitability of on-site soils for use as structural fill, fill placement and compaction and flexible asphalt pavement thickness and construction.


S&ME appreciates this opportunity to work with you as your geotechnical engineering consultant on this project. Please contact us at (803) 561-9024 if you have questions or need additional information regarding this report.

Sincerely,

S&ME, Inc.


Robert C. Bruorton, P.E.
Senior Engineer/Principal Project Manager




Matthew F. Cooke, P.G., P.E.
Office Principal

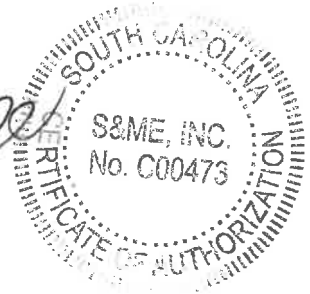




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- Appendix II – Field Test Results
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1.0 Project Information

Initial information regarding the project was provided in email correspondence from Allison Busch, of Thomas & Hutton, to Matt Cooke, of S&ME, on May 6, 2024. Included in the correspondence was a conceptual site plan for the site. Additional information was provided in email correspondence from Ms. Busch to Chad Bruorton, of S&ME, on the same day, which included the *Paving Grading and Drainage Plan*, prepared by Thomas & Hutton, dated May 3, 2024. Additional information was provided in email correspondence from Ms. Busch to Mr. Bruorton on June 19, 2024 that included the *Conceptual Master Plan*, prepared by Thomas & Hutton, dated July 12, 2022.

From our review of the provided information, we understand the site of the proposed development is located within the southeastern quadrant of the intersection of Columbia Highway (US Highway 378) and N Bouknight Ferry Road, in Saluda, South Carolina, as shown on the *Site Location Plan*, attached as Figure 1 in Appendix I. The planned development at the site is understood to consist of a new access road for the future Saluda Commerce Park.

The new access roadway is understood to extend from the existing roughly 200-foot paved tie-in into the site, in a south/southwestern direction, for roughly 1200 linear feet. The new access road is planned to include two 12-foot wide travel lanes with appropriate shoulders and terminate in a cul-de-sac. Conceptual plans indicate the road would provide access to potentially two industrial/manufacturing/warehouse type buildings of 150,000 and 255,000 square feet. Existing grades along the planned alignment range from roughly elevation 408 to 426 feet. Planned grades along the alignment range from elevation 412 to 417 feet. Therefore, it appears cuts of up to 9 feet and fills of up to 4 feet will be required to grade the alignment.

2.0 Exploration Procedures

The subsurface exploration of this project included three (3) Standard Penetration Test (SPT) borings and bulk sampling. The approximate boring locations are shown on the *Boring Location Plan*, attached as Figure 2 in Appendix I.

2.1 Reconnaissance of Project Area

On May 24, 2024, a representative from S&ME visited the site to observe current site conditions and lay out the proposed soil test boring locations. Soil test boring locations were marked in the field with white pin flags. Soil test boring locations were laid out using our sub-meter GPS equipment. The boring locations indicated on the attached *Boring Location Plan* must be considered as approximate. No formal survey of boring locations or elevations was conducted by S&ME.

2.2 Field Testing and Sampling

The following sections detail our field and sampling activities at the site. A summary of our exploration procedures is included in Appendix II.



2.2.1 *Site Clearing*

Clearing was performed by Palmetto State Land Management, under subcontract to S&ME, using a skid steer-mounted forestry grinder and operator on May 24, 2024, to create drill rig access pathways to the boring locations located in wooded areas. Trails approximately 12 to 15 feet wide were cleared with trees chipped in-place. No attempt was made to stack or remove downed trees from the site. Care was taken to limit site disturbance during this process.

2.2.2 *Standard Penetration Test (SPT) Soil Borings*

Three (3) soil test borings with Standard Penetration Test (SPT) sampling and testing were performed on June 6, 2024. The SPT soil test borings were performed by Southern Drill, Inc., under subcontract to S&ME, using an ATV-mounted CME-550 drill rig. The borings were advanced using 2¼-inch inside diameter hollow-stem auger drilling techniques. Borings were advanced to planned termination depths of roughly 5 to 15 feet below the existing ground surface.

Split-spoon samples and SPT Resistance N-values were obtained at selected intervals in general accordance with ASTM D1586. Representative samples of the soils obtained by the split-spoon sampler were collected and placed in sealed containers and transported to our laboratory.

2.2.3 *Ground Water Measurements*

Measurement of ground water was attempted in the borings shortly after drilling was completed. After a period of roughly 24 hours, ground water measurements were repeated in an attempt to obtain a stabilized ground water reading within the borings.

2.2.4 *Borehole Closure*

Following collection of relevant geotechnical data, boreholes were filled by slowly pouring auger cuttings into the open hole such that minimal “bridging” of the material occurred in the hole. Where borings exceed five feet in depth, a plastic hole plug was placed within the boreholes at a depth of approximately two feet below existing grade.

2.2.5 *Bulk Samples*

One (1) bulk sample, weighing roughly 75 to 100-pounds, were obtained for laboratory testing. The representative bulk sample of near-surface soils were obtained by randomly taking shovel loads of auger cutting spoils from the borings. The sample was placed in plastic bags/buckets and marked with appropriate descriptive information.

2.3 **Laboratory Testing**

Recovered split-spoon samples, the bulk samples and field logs were transported to our laboratory. The following laboratory testing was conducted on the bulk sample representative of planned fill/assumed pavement bearing soils during this exploration:



Table 2-1 – Classification, Proctor and CBR Laboratory Testing Summary

Laboratory Test	Specification	Quantity
Natural Moisture Content	ASTM D2216	1
Grain Size Analysis	ASTM D6913	1
Atterberg Limits	ASTM D4318	1
Standard Proctor	ASTM D698	1
California Bearing Ration (CBR)	ASTM D1883	1

A summary of our laboratory testing procedures and the laboratory test results are included in Appendix III.

3.0 Site Conditions

S&ME's assessment of the geotechnical conditions began with a reconnaissance of the topography and physical features of the site. We also consulted various available topographic and geologic maps for relevant information.

3.1 Surface Conditions

As previously mentioned, the project site is located within the southeastern quadrant of the intersection of Columbia Highway (US Highway 378) and N Bouknight Ferry Road, in Saluda, South Carolina. The site currently consists of a mixture of open fields and woodlands. A slight drainage feature was observed within the north-central portion of the alignment. The drainage feature was dry during our site visit and appeared to drain to the south. The site is bounded by undeveloped property to the northwest and southeast, with the existing paved tie-in to Columbia Highway to the northeast and an existing elevated water tower to the southwest.

3.2 Subsurface Conditions

Recovered field samples and field boring logs were reviewed in the laboratory by a member of our geotechnical staff. Soil test boring records and other field data are assembled in Appendix II.

3.2.1 Site Geology

The site is located in the Carolina Slate Belt section of the Piedmont Physiographic Province of South Carolina. The Carolina Slate Belt extends from Georgia to North Carolina and parts of Virginia. Over geologic time, the volcanic and sedimentary rocks, which the belt originally consisted of, were subjected to metamorphism, heat and pressure. The metamorphic process gave rise to the primary rock types evident today, referred to as metavolcanics. These metavolcanics include dacitic, rhyolitic, and andesitic flows along with tuffs and breccias. The metasediments found include argillite and slate, which the belt is named.

The topography and relief of the area has developed from differential weathering of the metamorphic rock. Ridges and hills have been developed on the more easily weathered and erodible rock. Because of the continued chemical and physical weathering, the rocks in the area are now generally covered with a mantle of soil that has weathered in place from the parent bedrock. These soils have variable thicknesses and are referred to as residuum or residual soils. The residuum is typically finer grained and has a higher clay content near the surface because of the advanced weathering. Similarly, the soils typically become coarser grained with increasing depth



because of decreased weathering. As the degree of weathering decreases, the residual soils generally retain the overall appearance, texture, gradation and foliations of the parent rock.

3.2.2 *Interpreted Subsurface Profile*

The generalized subsurface conditions at the site are described below. The discussed subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring records included in Appendix II should be reviewed for specific information at each boring location. The depth and thickness of the subsurface strata indicated on the boring records was estimated based on the drill cuttings and the samples recovered. The transition between materials may be more gradual than indicated on the boring records. Information on actual subsurface conditions exists only at the specific boring locations and is relevant to the time the exploration was performed. Variations may occur and should be expected at locations remote from the boring. The stratification lines were used for our analytical purposes and, unless specifically stated otherwise, should not be used as the basis for design or construction cost estimates.

Surface Materials

Surface materials in the form of gravel and topsoil, roughly 1 inch in thickness, were encountered in our borings along the alignment. We caution surface materials may be thicker in areas not explored at this time.

Piedmont Residuum

Beneath the surface materials, Piedmont residual soils were encountered to the termination depths of 5 to 15 feet below the existing ground surface. The residuum consisted of low to high plasticity fines with few to some fine to coarse sands (ML and MH). Some near-surface samples contained trace root fragments, while some deeper samples showed relict rock structure.

Recovered samples were dry to moist to the touch and were typically yellow, orange, red, purple and gray in color. SPT N-values ranged from 4 to 22 blows per foot (bpf), indicating soft to very stiff consistencies.

Ground Water

Ground water was not encountered at the time of boring or after a period of roughly 24 hours in the borings performed along the alignment.

From our understanding of existing and proposed grades along the alignment, it appears that ground water will not likely impact construction on this site. We note that ground water levels are influenced by precipitation, long term climatic variations and nearby construction. Measurements of ground water made at different times than our exploration may indicate ground water levels substantially different than indicated on the boring records in Appendix II.



3.3 Laboratory Physical Tests

3.3.1 *Compaction Behavior*

The bulk samples were compacted in standard molds using ASTM D698 Method A. A summary of the results is provided in the table below, with laboratory results presented in Appendix III:

Table 3-1 – Bulk Samples Moisture-Density Relationship Summary

Sample No.	Boring No.	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	USCS Soil Type
BS-1	P-3	90.4	25.6	MH

3.3.2 *Bearing Ratio Testing*

One (1) laboratory California Bearing Ratio test was performed for soaked specimens of BS-1, compacted to roughly 94 to 100 percent of the standard Proctor maximum dry density. The moisture contents were within minus 0.7 to plus 1 percent of the optimum moisture content value during remolding. The specimens were confined under a surcharge weight of 10 pounds during soak. The plots of CBR vs. penetration are included in Appendix III.

4.0 Conclusions and Recommendations

The following paragraphs include our conclusions and recommendations for site preparation, dewatering considerations (if necessary), excavation considerations, slope considerations, suitability of on-site soils for use as structural fill, fill placement and compaction and flexible asphalt pavement thickness and construction.

The soil profile encountered at this site appears marginally suitable for the proposed development. Conditions at this site do not appear to pose issues for site preparation or grading that differ substantially from the surrounding region.

4.1 Site Preparation

Site preparation should include removal of unsuitable surface materials along the proposed pavement alignment. This should include surface vegetation and organic laden topsoil, stumps, root bulbs, as well as unstable surface or subsurface soils. As previously mentioned, surface materials in the form of gravel/topsoil measuring up to roughly 1 inch in thickness were encountered at the ground surface across the site. However, it is possible that topsoil thickness may vary across the site.

Removal of stumps and roots will result in disturbance of the upper soils. In filled areas, the upper soils will need to be stabilized prior to placing fill. Stabilization, if required, may consist of removing and replacing unstable material or, where unstable soils are thin, wetting/drying and compacting in-place.



4.1.1 Clearing, Grubbing and Stripping

Topsoil thickness encountered in our borings measured up to 1 inch. The organic soil stripping process may expose deeper organic soils in portions of the alignment than suggested by the boring data. These soils often have a similar color to topsoil but contain only minor amounts of organics. The organic content of the topsoil materials encountered at the existing ground surface was not tested, therefore, the depth of initial stripping is not known at this time, and could vary, depending on the actual organic content of the soils and the project specifications. If these soils are to be re-used as structural fill, the organic content should be tested, in general accordance with ASTM D2974.

4.1.2 Surface Preparation/Proofrolling

In most areas, surface preparation can likely be limited to proofrolling of the surface. Areas that rut, pump, or move excessively under movement of the equipment need to be stabilized prior to placement of fill soil or base course stone. If the silts (ML and MH) are proofrolled during wet conditions, additional and widespread areas of stabilization may be required, as these materials are sensitive to changes in moisture.

After removal of topsoil and unsuitable soils/materials and cutting to grade, but prior to fill placement, the exposed ground surface should be observed by the geotechnical engineer or a representative of the geotechnical engineer to confirm that poor soils have been removed and that the exposed subgrade is suitable for support of the pavements. To aid in evaluation of the exposed soils, the area should be proofrolled using a loaded dump truck or similarly heavy piece of equipment. Areas that rut, pump, or move excessively under movement of the equipment should be stabilized prior to placement of fill or base course. If left in place, soft or wet soils will exhibit substantially lower bearing for pavements. Stabilization, if required, may consist of removing and replacing unstable material with properly compacted structural fill, or where unstable soils are thin, wet/drying and compacting in-place.

Care should be taken during construction so that the subgrade soils are not disturbed more than necessary. If heavily reworked or disturbed, stabilization may be required for what could otherwise be considered an acceptable subgrade.

4.1.3 Potential Subgrade Deterioration and Repair

The near-surface soils encountered in our borings mostly consist of silts (ML and MH), and therefore, the soils planned to be cut and re-used as fill consist of silts, which are highly susceptible to weather related deterioration. The exposed subgrade soil of both cut and fill areas can deteriorate when exposed to construction activities and environmental changes. Subgrade soil deterioration can occur from exposure to rainwater, rutting from construction traffic, freezing, and erosion. Exposed subgrades in structural areas that have deteriorated should be properly repaired by scarifying, moisture conditioning, and recompacting, or by undercutting and replacement immediately prior to construction. Drying may be accomplished by spreading and disking to maximize exposure to sun and wind during favorable drying weather or by chemical means.



4.1.4 *Wet Weather Grading*

Based on our experience, the silts (ML and MH), similar to those encountered in the borings along the alignment, will be difficult to work if allowed to become wet. Reasonable measures by the grading contractor to grade the surface to drain and seal the surface with a smooth drum roller prior to rainfall will likely be effective to limit risk of periodic rain significantly affecting grading.

Our experience also suggests that the movement of clearing and construction equipment on areas of standing water or saturated soils will result in degradation of the soils to depths of 1 to 2 feet. Repeated passes of equipment will cause rutting and the mixture of surface materials (organics) into what might otherwise be acceptable soils. Movement of construction equipment on saturated soils should be avoided where possible. Where organics and near surface soils become mixed, it will be necessary to remove and replace the mixed material. Most local contractors are familiar with these issues.

Drainage from the site should be provided and maintained prior to clearing and during grading to reduce the potential for ponding of water on exposed subgrades. Ditches should be excavated to help reduce rainwater runoff from flowing onto, and to help promote rainwater runoff from, the construction area. Rainwater should not be allowed to pond on pavement subgrades. In addition, we recommend the surface be “sealed” with a smooth drum roller if rain is pending to help reduce the potential for these upper soils becoming wet during rain events.

4.1.5 *Chemical Stabilization Techniques*

Chemical stabilization techniques could be utilized in order to lower the moisture content (short-term) and increase strength/durability (long-term) of the silty soils encountered along the alignment. These techniques should extend to a depth of at least 1 foot below structural subgrade in pavement areas. It should be noted that the success of chemical stabilization techniques is highly dependent upon the means and methods utilized by the contractor. Laboratory mix design testing on representative samples should be performed prior to use of these stabilization methods.

Lime stabilization would likely be more effective in the silty soils encountered at the site. The introduction of lime, combined with the high plasticity silty nature of the soils along the alignment, would result in a chemical reaction that would alter the soil matrix to decrease plasticity. A preliminary range of 2 to 6 percent by weight for lime should be considered for planning and cost estimation purposes depending on planned results. The lower end of this preliminary range would be more effective for short-term drying, while the higher end more effective for long-term stabilization.

4.2 **Excavation Considerations**

Piedmont residuum consisting of soft to very stiff consistency silts can be typically excavated using pans, scrapers, backhoes, and front-end loaders in mass grading. The degree of difficulty that mobile equipment will encounter rises dramatically in materials exceeding about 70 to 80 blows per foot. These conditions were generally not encountered in our soil borings.

4.3 General Comments on Slope Stability and Construction

Due to the existing and planned grades along the alignment, it appears that cut slopes are required near the cul-de-sac, while fill slopes will be required near the center of the alignment.

4.3.1 Temporary Excavation Stability

Excavations shall be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. The contractor is usually solely responsible for site safety. This information is provided only as a service, and under no circumstances shall S&ME be assumed to be responsible for construction site safety.

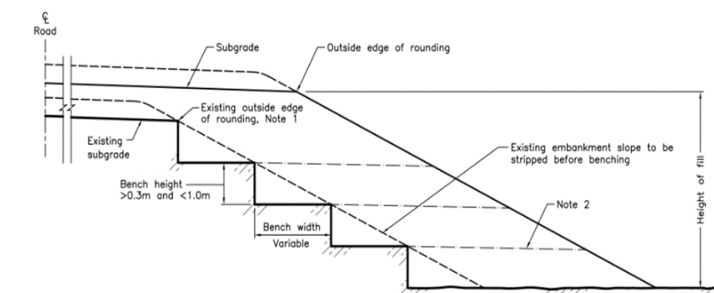
4.3.2 Excavation Slopes

Slope stability analysis is outside of our current scope of work; however, based upon our experience and information obtained by borings at the site, we recommend the excavated cut slopes not exceed a maximum inclination of 2H:1V (horizontal:vertical). These values are for planning purposes and will need to be confirmed during construction by direct observation of the excavated slopes, and inclinations modified, if necessary, based on the observed conditions. If these slopes are to be exceeded, then temporary/permanent retainage may be necessary.

4.3.3 Fill Slopes

Slope stability analysis is outside of our current scope of work; however, based upon our experience, permanent compacted fill slopes with inclinations of 2H:1V (horizontal:vertical) are generally considered stable if properly constructed.

To ensure stability, loose material should be removed (undercut) from the toe of the proposed fill slope or compacted as indicated in this report prior to placing fill. The fill slopes should be benched into existing sloping terrain and adequately compacted. Furthermore, we recommend that fill slopes constructed along existing slopes or embankments steeper than 4H:1V have a keyway constructed along the slope base to help counteract sliding failure. The keyway width should be at least 1/2 of the planned slope height, and the keyway should be embedded a minimum of 2 feet into medium dense/stiff soils.



- NOTES:
- 1 When the subgrade is below the existing outside edge of rounding, benching shall be carried out below the point where the subgrade intersects the existing slope.
 - 2 Benches are to be excavated one level at a time and the fill placed and compacted before the next bench is excavated.

Benching for Fill Slopes constructed along Existing Slopes



We recommend that compacted fill slopes be benched and slightly over-built, (in order to minimize the presence of a loose zone of poorly compacted soils near the slope face), and then cut back to firm, well compacted soils prior to the placement of structure or vegetative cover. Upon construction of a competent slope face, the slope face should be protected from erosion.

4.3.4 *General Slope Recommendations*

Recommended slopes are preliminary and assume that groundwater is controlled at the lowest level of the excavation continuously while the excavation is open. Groundwater is assumed not to flow or emerge from soil excavation slopes. Surface water is assumed to be captured by appropriate drainage measures above the slope crest and not allowed to drain down the slope. If perched groundwater is observed emerging from the face of the slope or if surface water is adversely affecting the slope, S&ME should be contacted immediately.

It is also assumed that excavated slopes are relatively uniform such that local slopes do not significantly exceed the recommended slopes. Finally, the recommended slope inclination assumes that slopes are monitored for indications of instability and that slopes are flattened or other measures taken if appropriate. Monitoring of the slopes during construction is presently not part of our contracted scope of services for this project.

Stability can be reduced by a number of additional factors including excessive erosion, non-uniform sloping resulting in areas of steeper grades, loose seams in the cut face, and/or ground water emerging from the cut slopes. As a result, proper channeling of surface water is critical. Surface runoff shall be directed away from the slopes via the use of berms, swales, or slope drains. For erosion protection, a protective cover of grass should be established on permanent soil slopes as soon as possible after slope construction. If loose seams are encountered within cut faces during excavation or ground water is encountered, an in-depth analysis of slope stability should be performed.

We caution against the installation of drop inlets or storm sewer lines within an improper embedment zone of the slope face, where possible over stressing and leakage may create maintenance problems or possible isolated slope failure. In general, these structures need to be installed a minimum distance of 1½ times the height of the embankment, as measured from the crest and/or toe of the slope. Furthermore, proper embedment of buried utilities beneath slope faces should be established prior to construction, with a minimum embedment for buried utilities recommended to be 3 feet below the down gradient portion of the slope.

4.4 **Use of On-site Soils as Structural Fill**

From our review of the provided existing and proposed grades, it appears that on-site soils excavated that may be reused as structural fill will typically range in USCS soil classification of silty soils with varying amounts of sands (ML and MH). These materials vary in depth and location across the site.

As previously mentioned, one (1) composite bulk sample was obtained from Boring P-3 and tested for maximum dry density, optimum moisture content and index properties. The following table summarizes these test results, while detailed test results are provided in Appendix III.



Table 4-1 – Assumed Planned Fill Laboratory Testing Results

Boring No.	Bulk Sample No.	Depth	USCS	Maximum Dry Density	Optimum Moisture Content	Natural Moisture Content	Percent Fines	LL	PL	PI
P-3	BS-1	0-5 ft	MH	90.4	25.6	30.8	89.2	59	38	21

From the results of our laboratory testing, the high plasticity silt material (MH) from this general vicinity, or within areas with similar USCS soil classifications, appears unsuitable for reuse as structural fill, unless steps are taken to modify or blend this material as discussed in previous and subsequent sections of this report. Low plasticity silt materials (ML), such as encountered in other areas of the alignment, are generally considered suitable to marginally suitable for reuse as structural fill.

4.4.1 Fine Grained Low Plasticity Proposed Fill Soils

Fine grained low plasticity silts containing varying amounts of sands (ML), similar to those encountered in areas of the exploration, are typically suitable to marginally suitable for use as structural fill. Suitability of these soils for use depends a great deal on the moisture content of the material at time of placement.

Marginal suitability refers to the fact that fine grained soils are moisture sensitive to some degree and can be difficult to work if allowed to become wet. These difficulties can include softening of exposed subgrade soils, excessive rutting or deflection under construction traffic, and the difficulty associated with adequately drying and compacting wet soil. Moisture-related earthwork difficulties can be reduced by performing the earthwork during the typically drier months of the year (May through October). Drainage from the site should be provided and maintained to reduce the potential for ponding of water on exposed subgrades.

4.4.2 High Plasticity Proposed Fill Soils

Design issues associated with use of high plasticity soils (MH) as fill include potential shrink/swell and low pavement subgrade strength. These design issues can be mitigated by restricting use of high plasticity soil materials as fill to depths of 5 feet or more below final grade in structural fill areas within the roadway alignment. At these depths, soils do not appreciably change soil moisture content, and therefore do not undergo appreciable change in volume. Additionally, high stresses associated with wheel loads have distributed sufficiently that high plasticity soil strengths are sufficient at these depths. These soils may also be used in non-structural fill or landscaped areas.

Construction issues associated with the use of on-site high plasticity soils as fill include drying prior to compaction and sensitivity to deterioration upon exposure to water. The construction issues can be mitigated by making provisions to moisture condition soils prior to compaction and repair of subgrades that deteriorated during construction. To improve the workability and behavioral characteristics of these soils, these soils could be blended with sandy off-site, borrow soils prior to placement as structural fill to the extent feasible. Alternatively, these soils may be improved by chemical stabilization as previously discussed.



4.5 Fill Placement and Compaction

Structural soil fill material should have less than 5 percent organic matter, a standard Proctor maximum dry density of 90 pcf or greater, a liquid limit (LL) of 50 percent or less, and a plasticity index (PI) of 30 percent or less. As previously noted, the high plasticity silts (MH), representative of bulk sample BS-1 do not meet these recommended properties. We recommend that off-site borrow, if necessary, meet the organic content, plasticity, and density requirements of this section. Testing will be required before fill placement begins to determine the optimum moisture-density condition for the fill materials. Material to be used as soil fill should be tested and approved by the geotechnical engineer before being placed.

4.5.1 Density and Moisture Requirements

Place fill in maximum 8-inch loose lifts and compact to at least 98 percent of maximum dry density (ASTM D698 standard Proctor). Fill moisture content should be maintained within +/- 2 percent of the optimum moisture content. Contractor should be prepared to wet or dry soils as necessary to achieve compaction. Fill should be placed level at least 5 feet beyond the pavement footprint before sloping. In addition to meeting the compaction requirement, fill material must be stable under movement of the construction equipment and must not exhibit rutting or pumping after compacting.

4.5.2 Compaction of Cohesive Soils

The compaction characteristics of silty soils (ML and MH) with plastic properties will be highly dependent on the soil moisture content at the time of construction. Sheep's-foot compactors will likely be preferable because the pads better penetrate the soil, and they tend to break down the natural cohesive bonds between the particles.

The water content of these soils is usually very difficult to modify in the field. Above or below the optimum moisture content, the soils become progressively more difficult to manipulate and compact. Soils excavated above the water table are usually close enough to optimum moisture content to place and compact efficiently with little moisture conditioning required. Soils that are initially too wet or are allowed to become wet due to rainfall are more difficult to use. Drying wet silty soils usually requires favorable weather conditions and often requires repeated disking and rolling with sheep's-foot rollers to lower the moisture content.

Slope the fill surface to drain and prevent ponding water. If rain is expected while filling is temporarily halted, roll the surface with rubber tire or steel drum equipment to improve surface run-off.

4.5.3 Monitoring and Testing

Fill placement should be witnessed by an experienced soils technician working under the guidance of the geotechnical engineer. We recommend full-time observation by a qualified soils technician with testing at random intervals to confirm compaction is being achieved. Part-time testing may suffice for the parking area and utility trench fills.

4.6 Pavement Support and Construction

From the provided information, we have assumed that the pavement section will consist of heavy-duty flexible asphalt pavement for access roadway leading from the existing roughly 200-foot paved tie-in into the site, in a south/southwestern direction roughly 1,200 linear feet.



4.6.1 *Subgrade Support Value*

As previously mentioned, one California Bearing Ratio (CBR) test was performed on the obtained bulk sample, which is assumed as planned pavement subgrade soils. The sample was compacted (remolded) to approximately 94 and 100 percent of the standard Proctor maximum dry density near the optimum moisture content. This test was performed on soils classified as an elastic silt (MH). High plasticity soils such as encountered on the site generally provide poor support for pavements.

Based on the laboratory test results and considering our experience with similar soils under similar loading conditions, a CBR value of roughly 3 percent, corresponding to a resilient modulus (MR) of 5,160 psi, is available for use in design of the pavement sections. Alternately, if chemical stabilization methods are utilized to modify and treat the in-place elastic silts (MH), a material more closely resembling a silty sand (SM) will likely result in a CBR value of roughly 8 percent, corresponding to a MR of 9,670 psi. This is assuming that pavement subgrades are prepared in accordance with previous sections of this report. This also assumes that fill material placed within the proposed pavement areas is placed and compacted according to the recommendations given in this report. Imported fill, if required, should be tested to determine that it exhibits a CBR equivalent to or exceeds the value assumed in pavement recommendations.

4.6.2 *Traffic Volumes*

It is understood that the roadway is related to a commerce park that will likely include industrial, manufacturing or warehouse space, however, traffic volumes are unknown. As previously discussed, conceptual plans indicate the potential for 150,000 square foot and 255,000 square foot facilities along the roadway. Each facility includes a truck court of approximately 72 and 86 truck bays, respectively, and employee parking of 165 and 325 spaces, respectively.

For purpose of fulfilling our contracted scope of services, we have assumed the following traffic volume scenarios for the planned access roadway:

- Each facility will operate on a 2 shift per day, 5 days a week schedule.
- Each facility will receive employee vehicle traffic equal to their provided parking lot capacity per shift per day.
- Each facility will receive tractor-trailer traffic equal to their assumed truck court capacity each day.
- Each facility will receive ancillary delivery truck traffic of 3 vehicles per day.
- Each facility will receive garbage truck traffic of 2 vehicles per week.

From the assumed traffic and loading conditions, we estimated the following for modeling purposes, with the calculated Equivalent Single Axle Load (ESAL) for flexible pavement analysis summarized below:

Heavy Duty Section (With truck traffic – tractor-trailer, garbage and fire truck traffic):

- Assumed 9,800 passenger vehicles per five-day week, with 0.006 ESAL per vehicle.
- Assumed 810 tractor-trailer truck vehicles per five-day week, with 2.37 ESAL per vehicle.
- Assumed 30 delivery-truck (package box truck) vehicles per five-day week, with 1.48 ESAL per vehicle,
- Assumed 4 garbage truck vehicles per five-day week, with 4.5 ESAL per vehicle.
- A design life of 20 years with 2,128,250 Equivalent Single Axle Loads (ESAL) over the design life.



We strongly emphasize that the assumptions made above do not represent a systematic analysis of traffic intensity at this location at this time or in the future. Once projected traffic volume and traffic loads are determined, recommended pavement sections should be reevaluated.

4.6.3 Flexible Asphalt Pavements

Pavement thickness computations were performed using the SCDOT *Pavement Design Guidelines – 2008* and AASHTO '93 *Flexible Pavement Design Method* for analysis of the unreinforced flexible pavement section. Based on the subsurface conditions and assuming our grading recommendations will be implemented as specified, the following presents our recommendations regarding typical pavement sections and materials.

Using the above-described assumed traffic loading conditions, we recommend the minimum pavement sections indicated in the table below.

Table 4-2 – Recommended Flexible Pavement Section Thickness

Pavement Designation	Subgrade CBR	Graded Aggregate Base Course	Asphalt Base Course	Asphalt Intermediate Course	Asphalt Surface Course
Heavy Duty	3%	8 inches	5 inches	2 inches	2 inches
		12 inches	3½ inches	2 inches	2 inches
	8%	8 inches	3½ inches	2 inches	2 inches
		12 inches	1¾ inches	2 inches	2 inches

Note: other combinations of pavement section material thicknesses or alternate subgrade soil materials can be evaluated if requested.

It is our opinion that the flexible pavement should consist of a wearing course of hot mix asphaltic (HMA) concrete, an intermediate course of HMA concrete, a base course of asphalt and a subbase course of either graded aggregate Macadam Base Course material or also include Cement-modified subbase. Base course material is necessary for structural support.

Materials and workmanship should meet the minimum requirements of the SCDOT *Standard Specifications for Highway Construction*, 2007 Edition and supplemental specifications. The applicable sections include the following:

Table 4-3 – SCDOT Pavement Section Material Specifications

Section	2007 SCDOT Standard Specification Section
Subgrade	Section 208, page 130
Graded Aggregate Base Course	Section 305, page 159
Asphalt Base Course – Type C-D/A-B	Section 309/310, page 182/186
Hot Mixed Asphalt Pavement	Section 401, page 188
Hot Mix Intermediate Course	Section 402, page 218
Hot Mix Asphalt Surface Course	Section 403, page 220
Hot Mix Asphalt Base Course	Section 403, page 220



Supplemental Specifications
HMA Material Properties, dated July 1, 2006
HMA Courses, dated July 2, 2006

Sufficient testing should be performed during flexible pavement installation to confirm that the required thickness, density, and quality requirements of the pavement specifications are followed. This is very important for the long-term performance of the pavement, and can be performed by S&ME, Inc. as part of our construction materials testing services.

Experience indicates that a thin surface overlay of asphalt pavement may be required in about 10 years due to normal wear and weathering of the surface. Such wear is typically visible in several forms of pavement distress, such as aggregate exposure and polishing, aggregate stripping, asphalt bleeding and various types of cracking. There are means to methodically estimate the remaining pavement life based on a systematic statistical evaluation of pavement distress density and mode of failure. We recommend the pavement be evaluated in about 7 years to assess the pavement condition and remaining life.

4.6.4 *Base Course Materials*

Base course materials assumed in computation of pavement sections above consists of materials meeting the hardness, durability, and gradation requirements of graded aggregate base course (GABC) defined in current SCDOT *Standard Specifications* (2007 edition) section 305. The crushed stone graded aggregate base course (GABC) used in pavement section construction should meet the requirements of Section 305 of the SCDOT *Standard Specifications* (2007 edition) and should consist of "Macadam Base Course" as defined by Section 305.02 of the SCDOT specification.

Fill placed in pavement areas should be compacted as recommended in preceding sections. Prior to pavement installation, exposed pavement subgrades should be methodically proofrolled at final subgrade elevation under the observation of the S&ME geotechnical engineer and identified unstable areas should be repaired as directed.

Base course should be compacted to at least 100 percent of the modified Proctor maximum dry density (ASTM D1557) and should not exhibit pumping or rutting under equipment traffic. Heavy compaction equipment is likely to be required to achieve the required base course compaction, and the moisture content of the material will likely need to be maintained very near the optimum moisture content in order to facilitate proper compaction. Base course of greater than 8 inches total thickness must be constructed in two lifts of approximately equal thickness. S&ME should be contacted to perform field density and thickness testing of the base course prior to paving.

4.6.5 *General*

Pavement performance is very dependent on subgrade condition. Drainage will have a major impact on subgrade condition. Drainage should be designed to result in subsurface water levels being at least 2 feet below the top of the pavement subgrade. Design should not result in water standing on the pavement surface or behind curbing. Landscaped areas behind curbing should be at or above the elevation of the curbing. Design should result in positive drainage being available from the stone base material.



The performance of the pavement will be influenced by a number of factors including the actual condition of subgrade soils at the time of pavement installation, installed thicknesses and compaction, and drainage. The subgrade soils should be re-evaluated by proofrolling immediately prior to placement of base course stone and unstable areas repaired. This recommendation is very important to the long-term performance of the pavements. Areas adjacent to pavements (embankments, landscaped island, ditching, etc.) which can drain water (rainwater or sprinklers) should be designed so that water does not seep below the pavements. This may require the use of French drains or swales. Sufficient tests and inspections should be performed during pavement installation to confirm that the required thickness, density, and quality requirements of the specifications are followed.

5.0 Qualifications of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other representation or warranty either express or implied, is made.

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants or presence of any biological materials (mold, fungi, and bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services if requested.

S&ME should be retained to review the final plans and specifications to confirm that earthwork, foundation, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and foundation construction activities

Appendices



Important Information About Your Geotechnical Engineering Report

Variations in subsurface conditions can be a principal cause of construction delays, cost overruns and claims. The following information is provided to assist you in understanding and managing the risk of these variations.

Geotechnical Findings Are Professional Opinions

Geotechnical engineers cannot specify material properties as other design engineers do. Geotechnical material properties have a far broader range on a given site than any manufactured construction material, and some geotechnical material properties may change over time because of exposure to air and water, or human activity.

Site exploration identifies subsurface conditions at the time of exploration and only at the points where subsurface tests are performed or samples obtained. Geotechnical engineers review field and laboratory data and then apply their judgment to render professional opinions about site subsurface conditions. Their recommendations rely upon these professional opinions. Variations in the vertical and lateral extent of subsurface materials may be encountered during construction that significantly impact construction schedules, methods and material volumes. While higher levels of subsurface exploration can mitigate the risk of encountering unanticipated subsurface conditions, no level of subsurface exploration can eliminate this risk.

Geotechnical Findings Are Professional Opinions

Professional geotechnical engineering judgment is required to develop a geotechnical exploration scope to obtain information necessary to support design and construction. A number of unique project factors are considered in developing the scope of geotechnical services, such as the exploration objective; the location, type, size and weight of the proposed structure; proposed site grades and improvements; the construction schedule and sequence; and the site geology.

Geotechnical engineers apply their experience with construction methods, subsurface conditions and exploration methods to develop the exploration scope. The scope of each exploration is unique based on available project and site information. Incomplete project information or constraints on the scope of exploration increases the risk of variations in subsurface conditions not being identified and addressed in the geotechnical report.

Services Are Performed for Specific Projects

Because the scope of each geotechnical exploration is unique, each geotechnical report is unique. Subsurface conditions are explored and recommendations are made for a specific project.

Subsurface information and recommendations may not be adequate for other uses. Changes in a proposed structure location, foundation loads, grades, schedule, etc. may require additional geotechnical exploration, analyses, and consultation. The geotechnical engineer should be consulted to determine if additional services are required in response to changes in proposed construction, location, loads, grades, schedule, etc.

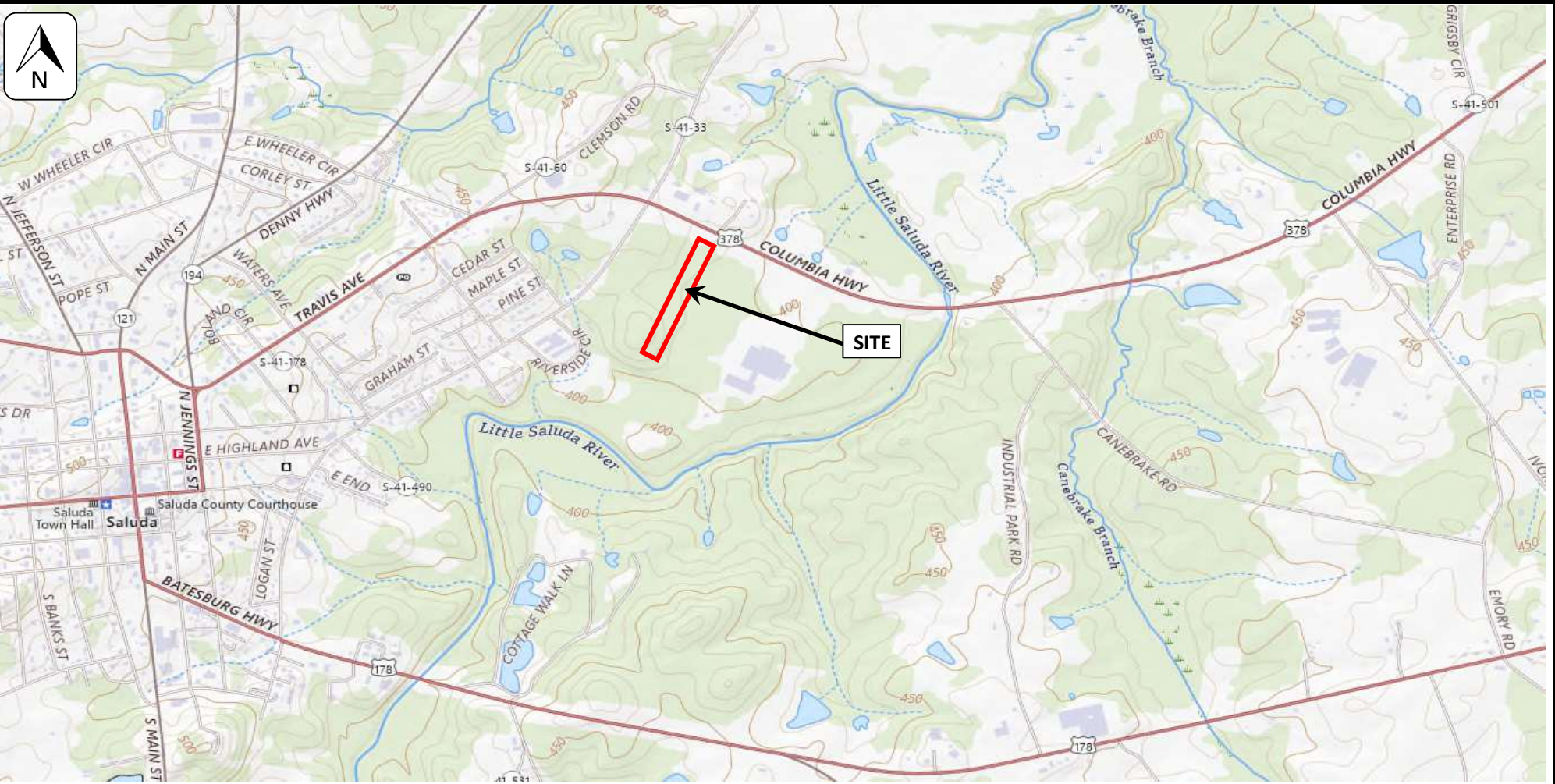
Geo-Environmental Issues

The equipment, techniques, and personnel used to perform a geo-environmental study differ significantly from those used for a geotechnical exploration. Indications of environmental contamination may be encountered incidental to performance of a geotechnical exploration but go unrecognized. Determination of the presence, type or extent of environmental contamination is beyond the scope of a geotechnical exploration.

Geotechnical Recommendations Are Not Final

Recommendations are developed based on the geotechnical engineer's understanding of the proposed construction and professional opinion of site subsurface conditions. Observations and tests must be performed during construction to confirm subsurface conditions exposed by construction excavations are consistent with those assumed in development of recommendations. It is advisable to retain the geotechnical engineer that performed the exploration and developed the geotechnical recommendations to conduct tests and observations during construction. This may reduce the risk that variations in subsurface conditions will not be addressed as recommended in the geotechnical report.

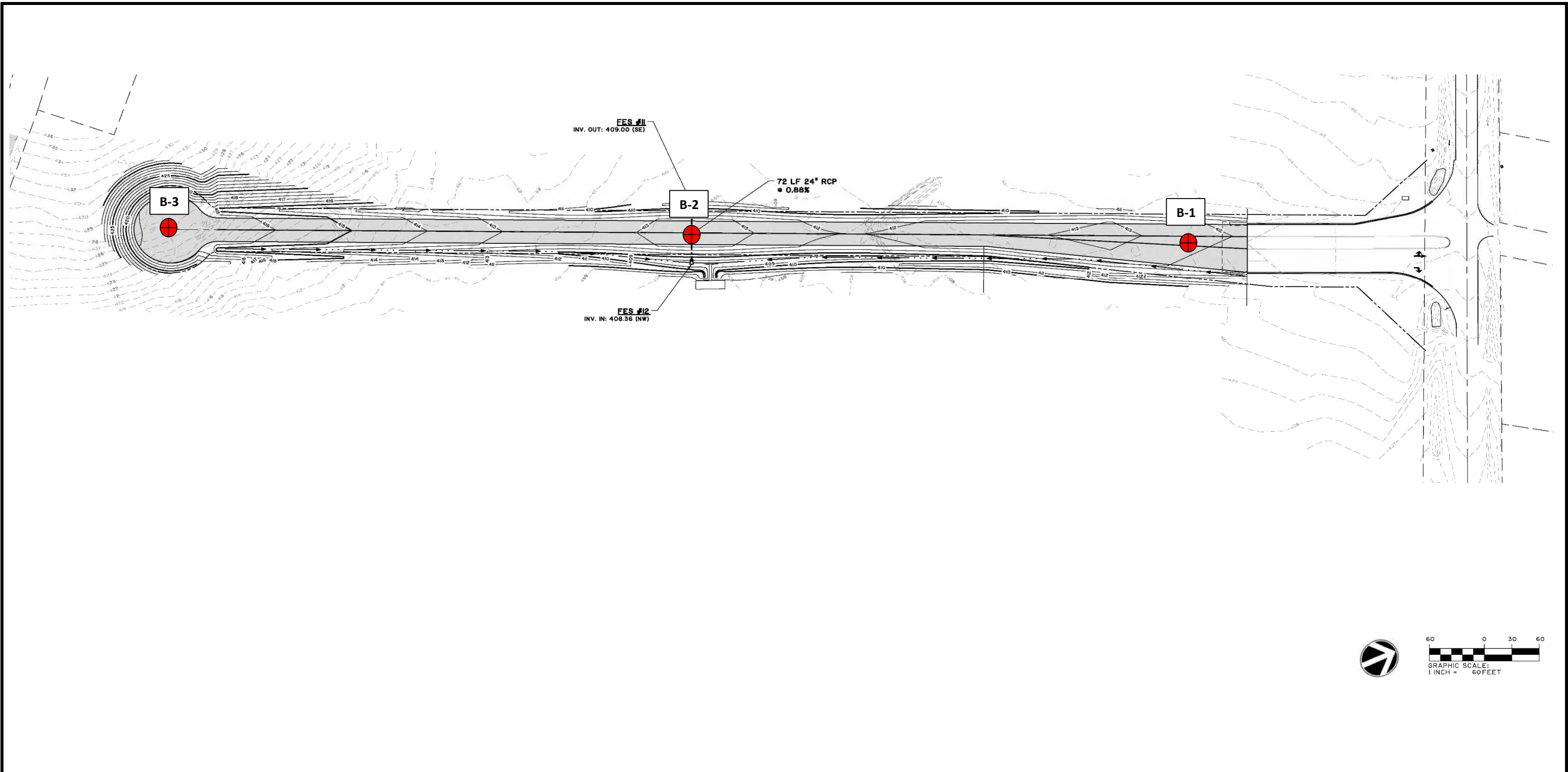
Appendix I – Figures



SOURCE: USGS National Topo



SITE LOCATION PLAN		FIGURE NO.	
JOB NAME:	Saluda Commerce Park - Access Road	1	
LOCATION:	4100 Columbia Highway (US-378)		
CITY, STATE:	Saluda, South Carolina		
JOB NO.:	24610251		
SCALE:	NTS	CHECKED BY:	RCB
DATE:	6/20/2024	DRAWN BY:	JPL



SOURCE: Paving, Grading and Drainage Plan, prepared by Thomas & Hutton, dated 5-3-24



BORING LOCATION PLAN		FIGURE NO.
JOB NAME:	Saluda Commerce Park - Access Road	2
LOCATION:	4100 Columbia Highway (US-378)	
CITY, STATE:	Saluda, South Carolina	
JOB NO.:	24610251	
SCALE:	AS SHOWN	CHECKED BY: MFC
DATE:	6/20/2024	DRAWN BY: RCB

Appendix II – Field Test Results

LEGEND TO SOIL CLASSIFICATION AND SYMBOLS




SOIL TYPES

(Shown in Graphic Log)

	Fill
	Asphalt
	Concrete
	Topsoil
	Gravel
	Sand
	Silt
	Clay
	Organic
	Silty Sand
	Clayey Sand
	Sandy Silt
	Clayey Silt
	Sandy Clay
	Silty Clay
	Partially Weathered Rock
	Cored Rock

WATER LEVELS

(Shown in Water Level Column)

-  = Water Level At Termination of Boring
-  = Water Level Taken After 24 Hours
-  = Loss of Drilling Water
- HC = Hole Cave

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY

Very Soft	0 to 2
Soft	3 to 4
Firm	5 to 8
Stiff	9 to 15
Very Stiff	16 to 30
Hard	31 to 50
Very Hard	Over 50

STD. PENETRATION
RESISTANCE
BLOWS/FOOT

RELATIVE DENSITY OF COHESIONLESS SOILS

RELATIVE DENSITY

Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	Over 50

STD. PENETRATION
RESISTANCE
BLOWS/FOOT

SAMPLER TYPES

(Shown in Samples Column)

-  Shelby Tube
-  Split Spoon
-  Rock Core
-  No Recovery

TERMS

Standard Penetration Resistance - The Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586.

REC - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%.

RQD - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.



DATE DRILLED: 6/6/24	ELEVATION: 411.0 ft	NOTES: Northing and Easting converted from Latitude and Longitude from Google Earth. Elevation estimated from <i>Paving, Grading, and Drainage Plan</i> , prepared by Thomas & Hutton, dated 5/3/24. No formal survey performed by S&ME.
DRILL RIG: CME-550	BORING DEPTH: 5.0 ft	
DRILLER: H. Wessinger	WATER LEVEL: Not Encountered	
HAMMER TYPE: Automatic	LOGGED BY: RZZ	

SAMPLING METHOD: Split spoon	NORTHING: 792784	EASTING: 1772607
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DRILLING METHOD: **2 1/4" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft) /REMARKS				N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	60	
		SURFACE MATERIAL - GRAVEL - 1 inch												
		PIEDMONT RESIDUUM - SILT WITH SAND (ML) - mostly low plasticity sands, little fine to coarse sand, dry, brownish yellow with orange and black mottles, soft.					2	2	2					4
		ELASTIC SILT WITH SAND (MH) - mostly high plasticity fines, little fine to medium sand, dry, mottled brownish yellow and orange, very stiff.					5	7	10					17
5		Boring terminated at 5 ft		406.0										

S&ME BORING LOG_24610251 BORING LOGS.GPJ_SME COLUMBIA GINT DATA TEMPLATE.GDT_6/20/24

NOTES:



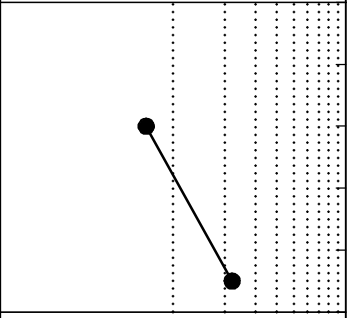
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 6/6/24	ELEVATION: 409.0 ft	NOTES: Northing and Easting converted from Latitude and Longitude from Google Earth. Elevation estimated from <i>Paving, Grading, and Drainage Plan</i> , prepared by Thomas & Hutton, dated 5/3/24. No formal survey performed by S&ME.
DRILL RIG: CME-550	BORING DEPTH: 5.0 ft	
DRILLER: H. Wessinger	WATER LEVEL: Not Encountered	
HAMMER TYPE: Automatic	LOGGED BY: RZZ	

SAMPLING METHOD: Split spoon	NORTHING: 792306	EASTING: 1772339
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DRILLING METHOD: **2 1/4" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft) /REMARKS				N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	60	
5		<p>SURFACE MATERIAL - TOPSOIL - 1 inch</p> <p>PIEDMONT RESIDUUM - E:ASTIC SILT (MH) - mostly high plasticity fines, few fine to medium sand, dry, mottled brownish yellow, orange and light gray, firm.</p> <p>--- @ 3.5 ft - mottled brownish yellow and light gray, very stiff.</p>		404.0			3	4	3					7 22
		Boring terminated at 5 ft												

S&ME BORING LOG_24610251 BORING LOGS.GPJ_SME COLUMBIA GINT DATA TEMPLATE.GDT_6/20/24

NOTES:

1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 6/6/24	ELEVATION: 426.0 ft	NOTES: Northing and Easting converted from Latitude and Longitude from Google Earth. Elevation estimated from <i>Paving, Grading, and Drainage Plan</i> , prepared by Thomas & Hutton, dated 5/3/24. No formal survey performed by S&ME.
DRILL RIG: CME-550	BORING DEPTH: 15.0 ft	
DRILLER: H. Wessinger	WATER LEVEL: Not Encountered	
HAMMER TYPE: Automatic	LOGGED BY: RZZ	

SAMPLING METHOD: Split spoon	NORTHING: 791802	EASTING: 1772062
DRILLING METHOD: 2 1/4" H.S.A.		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)					N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/REMARKS					
										10	20	30	60	80	
		SURFACE MATERIAL - TOPSOIL - 1 inch PIEDMONT RESIDUUM - SANDY ELASTIC SILT (MH) - mostly high plasticity fines, some fine sand, trace root fragments, dry to moist, red with brownish yellow mottles, soft. --- @ 3.5 ft - very stiff.				▼	1	2	2	●					4
5		SILT (ML) - mostly low plasticity fines, few fine sand, dry, slightly laminated red, brownish yellow and purple, firm, relict rock structure. --- @ 8.5 ft - slightly laminated red, purple and brownish black, very stiff.	HC	421.0		▼	7	8	12	●					20
10		--- @ 13.5 ft - slightly laminated brownish red, purple and brownish yellow, stiff.		416.0		▼	5	4	4	●					8
15		--- @ 13.5 ft - slightly laminated brownish red, purple and brownish yellow, stiff. Boring terminated at 15 ft		411.0		▼	5	5	6	●					16
										●					11

S&ME BORING LOG_24610251 BORING LOGS.GPJ_SME COLUMBIA GINT DATA TEMPLATE.GDT_6/20/24

NOTES:

1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.





Summary of Field Procedures

◆ Boring and Sampling

Soil Test Boring with Hollow-Stem Auger

Soil sampling and penetration testing were performed in general accordance with ASTM D1586, *Standard Test Method for Penetration Test and Split Barrel Sampling of Soils*. Borings were made by mechanically twisting a continuous steel hollow stem auger into the soil. At regular intervals, soil samples were obtained with a standard 1.4-inch I. D., 2-inch O. D., split barrel sampler. The sampler was first seated six inches to penetrate any loose cuttings, then driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler through the two final six inch increments was recorded as the penetration resistance (SPT N) value. The N-value, when properly interpreted by qualified professional staff, is an index of the soil strength and foundation support capability.

Bulk Samples

At selected locations and depths, representative bulk samples of the soils were obtained by randomly taking shovel loads from the cuttings or spoil brought to the surface, until a sample of 30 to 50 pounds was obtained. The sample was placed in a cloth or plastic sack marked with appropriate descriptive information. Samples were protected from freezing at all times.

Borehole Closure

Following collection of relevant geotechnical data, boreholes were filled by slowly pouring auger cuttings into the open hole such that minimal "bridging" of the material occurred in the hole. Backfilling of the upper two feet of each hole was tamped as heavily as possible with a shovel handle or other hand held equipment, and the backfill crowned to direct rainfall away on the surface. Where boreholes exceeded five feet in depth, a plastic hole plug was firmly tamped into place within the backfill at a depth of about two feet.

Preservation and Transporting of Soil Samples with Control of Field Moisture

Procedures for preserving soil samples obtained in the field and transportation of samples to the laboratory generally followed those given in ASTM D4220, *Standard Practice for Preserving and Transporting Soil Samples* for Group B samples as defined in Section 4. Group B samples are those samples not suspected of being contaminated and for which only water content and classification, proctor, relative density, or profile logging will be performed. Group B samples also include bulk samples that are intended to be remolded in the laboratory for compaction, swell pressure, percent swell, consolidation, permeability, CBR, or shear testing. Representative samples of the cuttings or split spoon samples, or representative bulk samples, were placed in suitably identified, sealed glass jars or plastic containers and transported to the laboratory. Sample identification numbers on the containers corresponded to sample numbers recorded on field boring records or test pit records. Thin-walled tube samples were sealed at the ends with paraffin and capped with plastic end caps.

◆ Field Tests of Earth Materials

The subsurface conditions encountered during drilling were reported on a field test boring record by the chief driller. The record contains information about the drilling method, samples attempted and sample recovery, indications of materials in the borings such as coarse gravel, cobbles, etc., and indications of materials encountered between sample intervals. Representative soil samples were placed in glass jars and transported to the laboratory along with the field boring records. Recovered samples not expended in laboratory tests are commonly retained in our laboratory for 60 days following completion of drilling. Field boring records are retained at our office.

Measurement of Static Water Levels

Water level readings were made in the open boreholes immediately after completing drilling and withdrawal of the tools. Where feasible, measurements were repeated after an elapsed period of 24 hours to gauge the stabilized water level. Procedures for measurement of liquid levels in open boreholes are described in ASTM D4750, *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)*. A calibrated cable with electrical wire encased, equipped with a weighted sensing tip at one end and an electric meter at the other, was slowly lowered into each borehole until the liquid surface was penetrated by the weighted end. Contact with the water closed an electric circuit and was recorded by the meter. The depth reading on the cable was then recorded relative to a reference point on the surface. Measurements made by this method were then repeated until approximately consistent values were obtained.

Appendix III – Laboratory Test Results

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



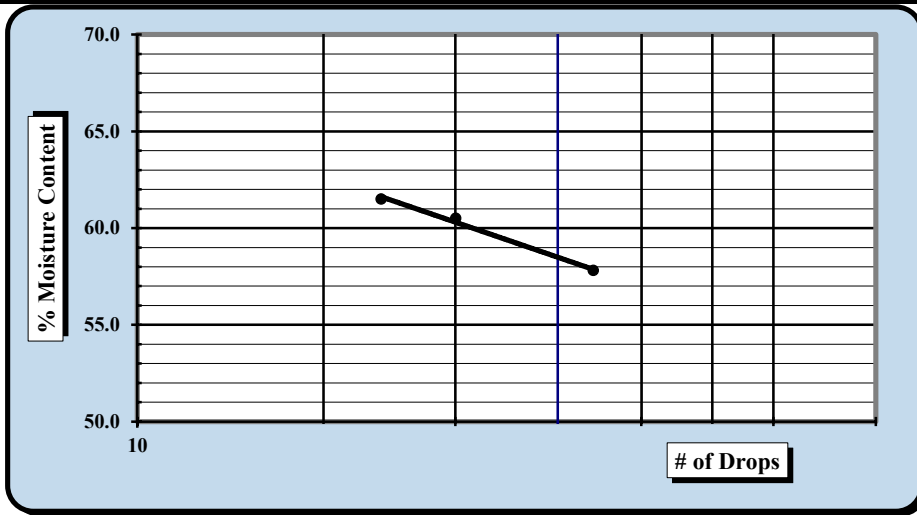
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	24610251	Report Date:	6/13/24
Project Name:	Saluda Commerce Park - Access Road	Test Date(s)	6/10 - 6/13
Client Name:	Thomas & Hutton		
Client Address:	1501 Main St., Suite 400, Columbia, SC 29201		
Boring #:	P-3	Sample #:	BS-1
Location:	Roadway Alignment	Offset:	N/A
		Elevation:	0-5 ft

Sample Description: Red Sandy Elastic SILT (MH)					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	10/13/2023	Grooving tool	35863	1/2/2024
LL Apparatus	35861	1/2/2024	Grooving tool		
Oven	25722	1/2/2024	Grooving tool		

Pan #	Tare #:	Liquid Limit						Plastic Limit		
		1	2	3	4	5	6	7	8	9
A	Tare Weight	20.86	20.71	21.01				20.92	20.93	
B	Wet Soil Weight + A	33.06	31.59	31.72				27.55	27.58	
C	Dry Soil Weight + A	28.59	27.49	27.64				25.73	25.76	
D	Water Weight (B-C)	4.47	4.10	4.08				1.82	1.82	
E	Dry Soil Weight (C-A)	7.73	6.78	6.63				4.81	4.83	
F	% Moisture (D/E)*100	57.8%	60.5%	61.5%				37.8%	37.7%	
N	# OF DROPS	27	20	17				Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average							37.8%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic

Liquid Limit **59**

Plastic Limit **38**

Plastic Index **21**

Group Symbol **MH**

Multipoint Method

One-point Method

Wet Preparation Dry Preparation Air Dried

Notes / Deviations / References:
 Group Symbol refers to material passing the No. 40 sieve.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

John Thornton
 Technician Name

6/13/2024
 Date

Michael Frisina
 Technical Responsibility

6/13/2024
 Date

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MOISTURE - DENSITY REPORT

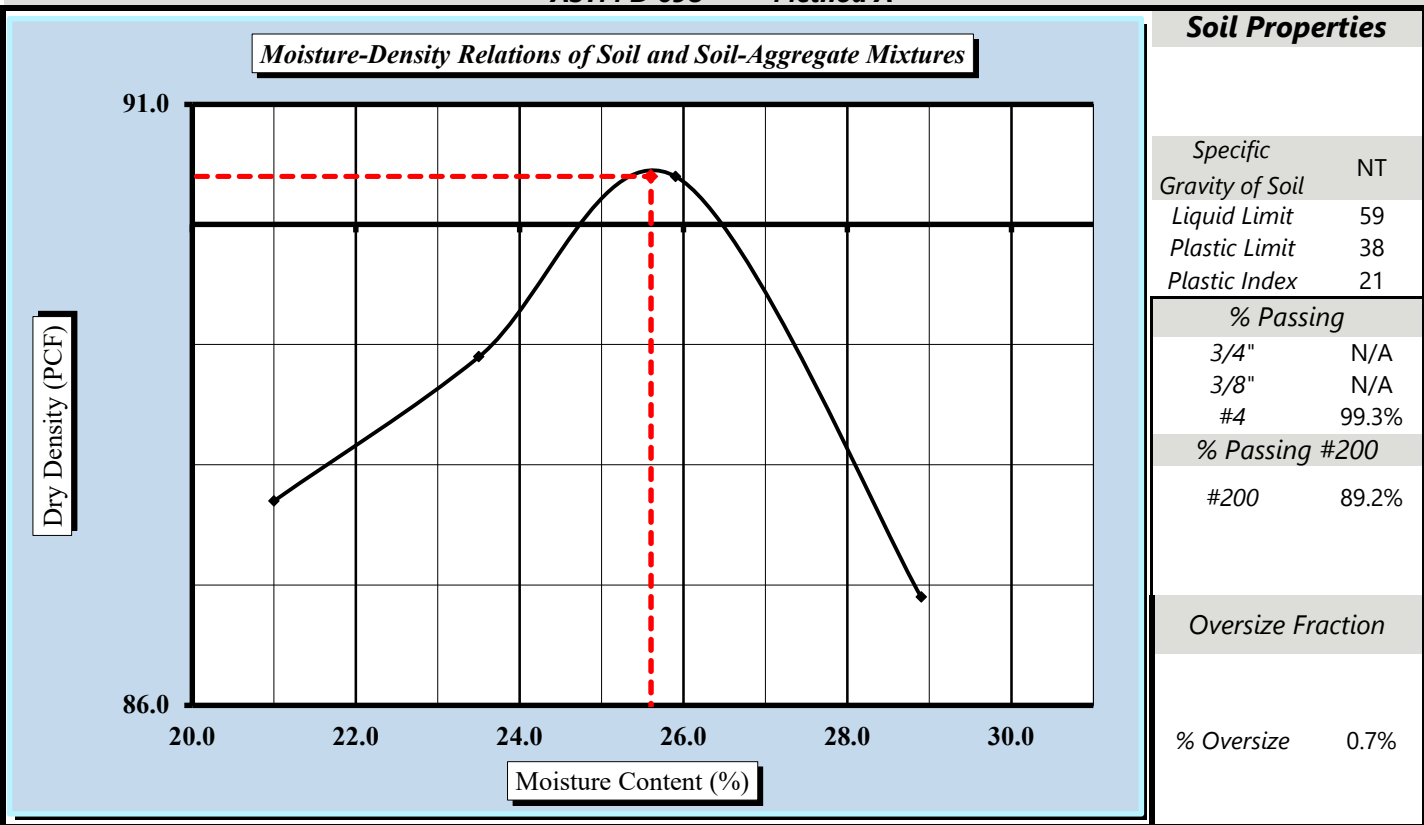


Quality Assurance

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210			
S&ME Project #:	24610251	Report Date:	6/13/24
Project Name:	Saluda Commerce Park - Access Road	Test Date(s):	6/10 - 6/13/24
Client Name:	Thomas & Hutton		
Client Address:	1501 Main St., Suite 400, Columbia, SC 29201		
Boring #:	P-3	Sample #:	BS-1
Location:	Roadway Alignment	Sample Date:	6/6/2024
	Offset:	N/A	Depth:
			0-5 ft
Sample Description:	Red Sandy Elastic SILT (MH)		

Maximum Dry Density 90.4 PCF. Optimum Moisture Content 25.6%

ASTM D 698 - - Method A



Moisture-Density Curve Displayed: Fine Fraction Corrected for Oversize Fraction (ASTM D 4718)
 Sieve Size used to separate the Oversize Fraction: #4 Sieve 3/8 inch Sieve 3/4 inch Sieve
 Mechanical Rammer Manual Rammer Moist Preparation Dry Preparation

References / Comments / Deviations:

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
 ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Michael Frisina
 Technical Responsibility

Signature

Lab Services Manager
 Position

6/13/2024
 Date

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CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL



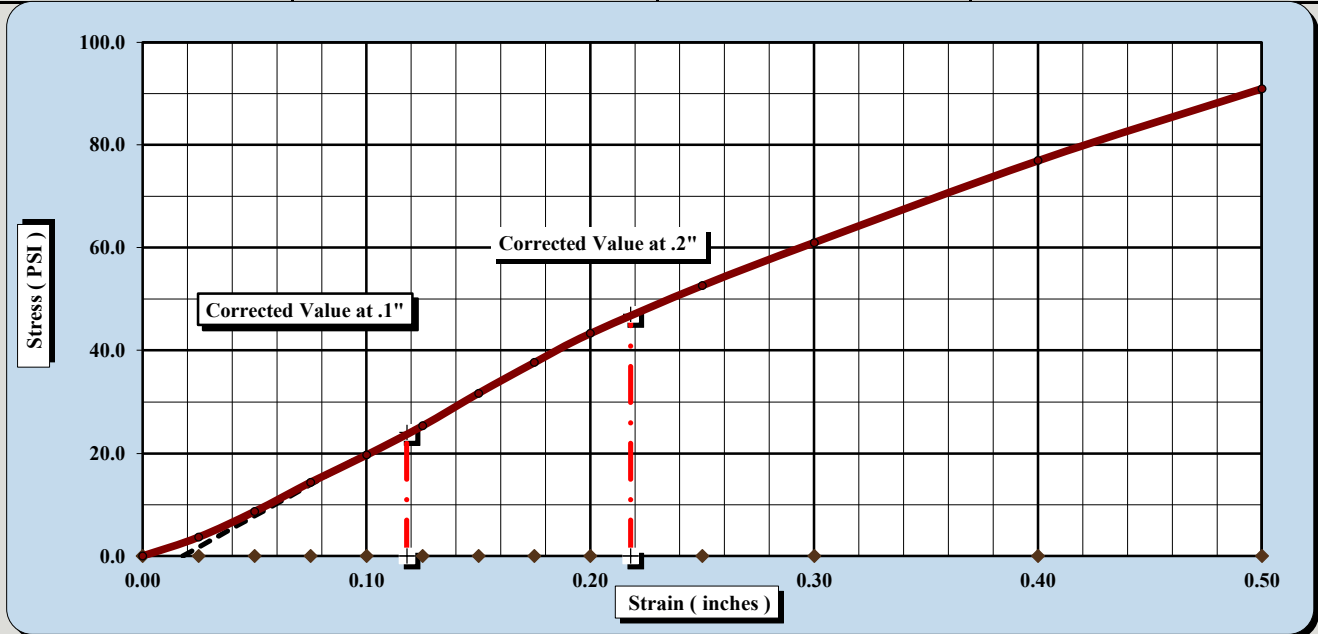
ASTM D 1883

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	24610251	Report Date:	6/19/24
Project Name:	Saluda Commerce Park - Access Road	Test Date(s)	6/10 - 6/19/24
Client Name:	Thomas & Hutton	23813	
Client Address:	1501 Main St., Suite 400, Columbia, SC 29201		
Boring #:	P-3	Sample #:	BS-1
		Sample Date:	6/6/24
Location:	Borings	Offset:	N/A
		Depth:	0-5 ft
Sample Description:	Red Sandy Elastic SILT (MH)		

ASTM D 698	Method A	Maximum Dry Density:	90.4	PCF	Optimum Moisture Content:	25.6%	
Line 20: Use an alternate discription here if applicable				% Retained on the 3/4" sieve:			0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	2.0	CBR at 0.2 in.	2.9
CBR at 0.1 in.	2.4	CBR at 0.2 in.	3.1



CBR Sample Preparation:

Grading was in accordance with the above method and compacted using the 6" diameter CBR mold. ASTM D1883, Section 6.1.1

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	25	Final Dry Density (PCF)	82.3
Initial Dry Density (PCF)	84.6	Moisture Content (top 1" after soaking)	37.0%
Moisture Content of the Compacted Specimen	25.8%	Percent Swell	2.7%
Percent Compaction	93.6%		

Soak Time:	96 hrs	Surcharge Weight	10.0
Liquid Limit	59	Plastic Index	21
		Surcharge Wt. per sq. Ft.	50.9
		Apparent Relative Density	N/A

Notes/Deviations/References: Liquid Limit: ASTM D 4318, Specific Gravity: ASTM D 854, Classification: ASTM D 2487

Michael Frisina
Technical Responsibility

Signature

Lab Services Manager
Position

6/19/2024
Date

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CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL



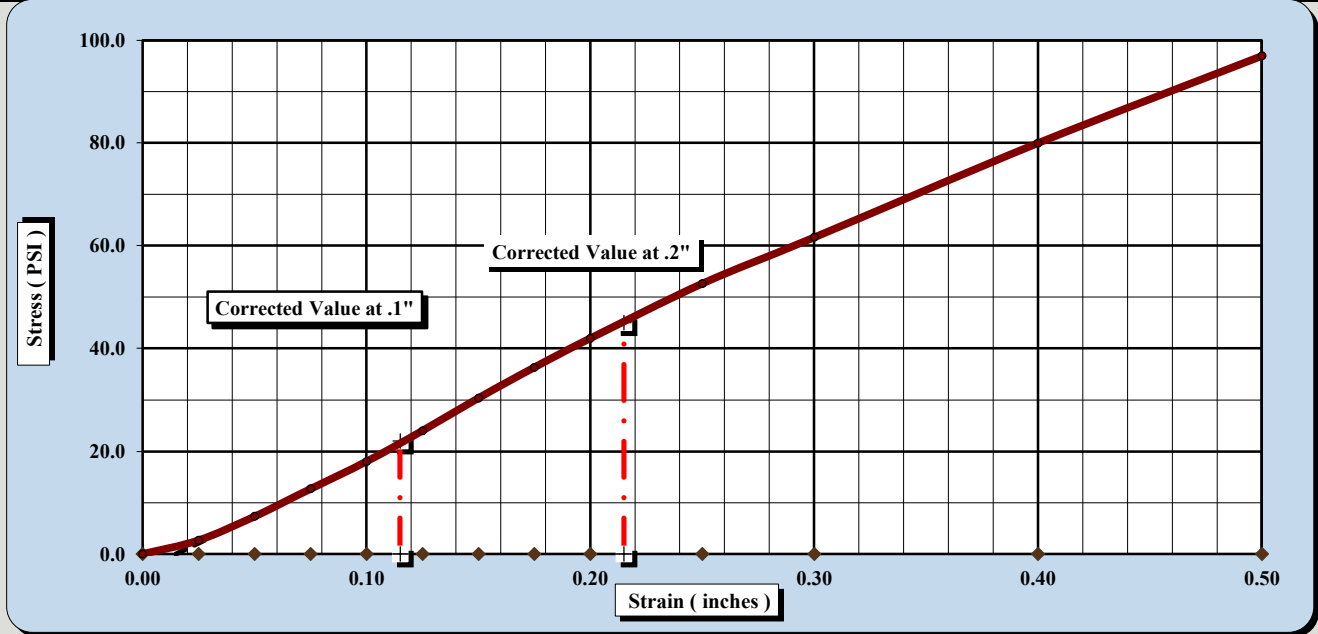
ASTM D 1883

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	24610251	Report Date:	6/19/24
Project Name:	Saluda Commerce Park - Access Road	Test Date(s)	6/10 - 6/19/24
Client Name:	Thomas & Hutton	28692	
Client Address:	1501 Main St., Suite 400, Columbia, SC 29201		
Boring #:	P-3	Sample #:	BS-1
		Sample Date:	6/6/24
Location:	Borings	Offset:	N/A
		Depth:	0-5 ft
Sample Description:	Red Sandy Elastic SILT (MH)		

ASTM D 698	Method A	Maximum Dry Density:	90.4	PCF	Optimum Moisture Content:	25.6%
Line 20: Use an alternate description here if applicable					% Retained on the 3/4" sieve:	0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	1.8	CBR at 0.2 in.	2.8
		CBR at 0.1 in.	2.2
		CBR at 0.2 in.	3.0



CBR Sample Preparation:

Grading was in accordance with the above method and compacted using the 6" diameter CBR mold. ASTM D1883, Section 6.1.1

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	35	Final Dry Density (PCF)	82.9
Initial Dry Density (PCF)	85.5	Moisture Content (top 1" after soaking)	36.0%
Moisture Content of the Compacted Specimen	26.3%	Percent Swell	3.0%
Percent Compaction	94.5%		

Soak Time:	96 hrs	Surcharge Weight	10.0
Liquid Limit	59	Plastic Index	21
		Surcharge Wt. per sq. Ft.	50.9
		Apparent Relative Density	N/A

Notes/Deviations/References: Liquid Limit: ASTM D 4318, Specific Gravity: ASTM D 854, Classification: ASTM D 2487

Michael Frisina
Technical Responsibility

Signature

Lab Services Manager
Position

6/19/2024
Date

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CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL



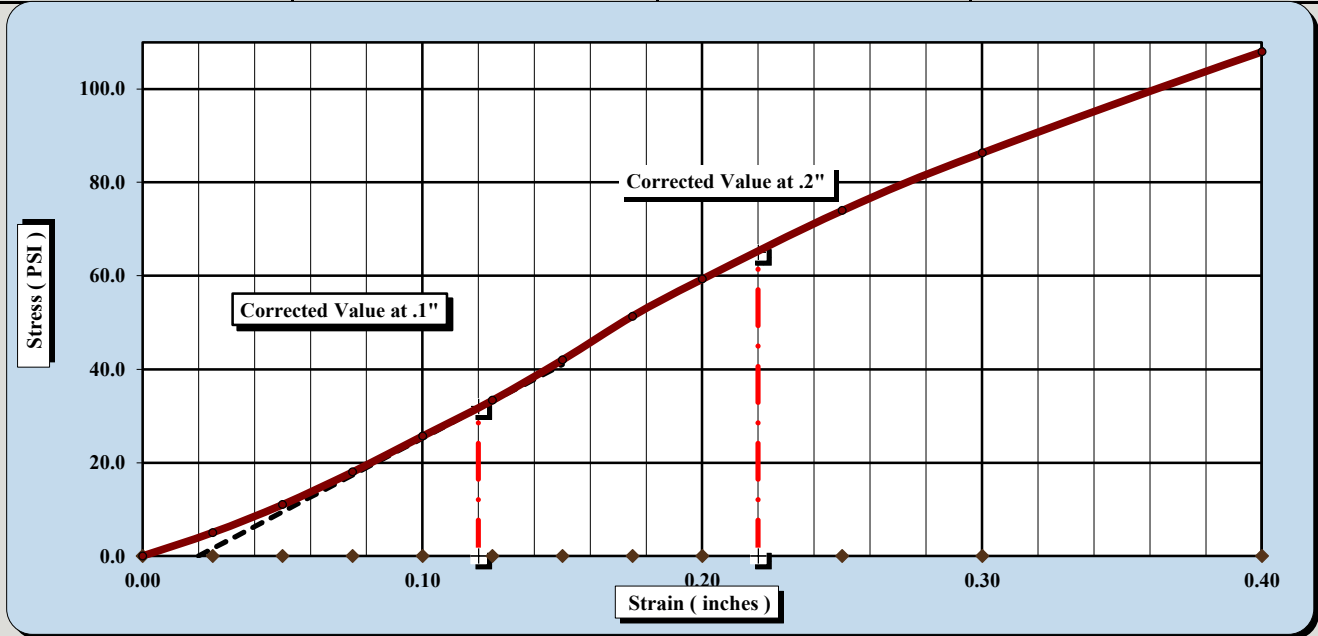
ASTM D 1883

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	24610251	Report Date:	6/19/24
Project Name:	Saluda Commerce Park - Access Road	Test Date(s)	6/10 - 6/19/24
Client Name:	Thomas & Hutton	21785	
Client Address:	1501 Main St., Suite 400, Columbia, SC 29201		
Boring #:	P-3	Sample #:	BS-1
		Sample Date:	6/6/24
Location:	Borings	Offset:	N/A
		Depth:	0-5 ft
Sample Description:	Red Sandy Elastic SILT (MH)		

ASTM D 698 Method A Maximum Dry Density: 90.4 PCF Optimum Moisture Content: 25.6%
 Line 20: Use an alternate description here if applicable % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	2.6	CBR at 0.1 in.	3.2
CBR at 0.2 in.	4.0	CBR at 0.2 in.	4.3



CBR Sample Preparation:

Grading was in accordance with the above method and compacted using the 6" diameter CBR mold. ASTM D1883, Section 6.1.1

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	56	Final Dry Density (PCF)	87.0
Initial Dry Density (PCF)	90.0	Moisture Content (top 1" after soaking)	33.8%
Moisture Content of the Compacted Specimen	24.6%	Percent Swell	3.3%
Percent Compaction	99.5%		

Soak Time: 96 hrs	Surcharge Weight 10.0	Surcharge Wt. per sq. Ft. 50.9	
Liquid Limit 59	Plastic Index 21	Apparent Relative Density	N/A

Notes/Deviations/References: Liquid Limit: ASTM D 4318, Specific Gravity: ASTM D 854, Classification: ASTM D 2487

Michael Frisina
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Summary of Laboratory Procedures

Recovered disturbed and undisturbed samples and the drillers' field logs were transported to the laboratory where they were examined by the geotechnical engineer. Selected samples representative of certain groups of soils were subjected to simple classification tests by hand or other simple means. Other samples were tested in the laboratory to determine their strength or consolidation properties.

◆ Laboratory Tests of Soil

Examination of Split Spoon Soil Samples

Soil and rock samples and field boring records were reviewed in the laboratory by the geotechnical engineer. Soils were classified in general accordance with the visual-manual method described in ASTM D 2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Method)*. The geotechnical engineer also prepared the final boring records enclosed with this report.

Moisture Content Testing of Soil Samples by Oven Drying

Moisture content was determined in general conformance with the methods outlined in ASTM D2216, "Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil or Rock by Mass." This method is limited in scope to Group B, C, or D samples of earth materials which do not contain appreciable amounts of organic material, soluble solids such as salt or reactive solids such as cement. This method is also limited to samples which do not contain contamination.

A representative portion of the soil was divided from the sample using one of the methods described in Section 9 of ASTM D2216. The split portion was then placed in a drying oven and heated to approximately 110 degrees C overnight or until a constant mass was achieved after repetitive weighing. The moisture content of the soil was then computed as the mass of water removed from the sample by drying, divided by the mass of the sample dry, times 100 percent. No attempt was made to exclude any particular particle size from the portion split from the sample.

Liquid and Plastic Limits Testing

Atterberg limits of the soils was determined generally following the methods described by ASTM D4318, *Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*. Albert Atterberg originally defined "limits of consistency" of fine grained soils in terms of their relative ease of deformation at various moisture contents. In current engineering usage, the liquid limit of a soil is defined as the moisture content, in percent, marking the upper limit of viscous flow and the boundary with a semi-liquid state. The plastic limit defines the lower limit of plastic behavior, above which a soil behaves plastically below which it retains its shape upon drying. The plasticity index (PI) is the range of water content over which a soil behaves plastically. Numerically, the PI is the difference between liquid limit and plastic limit values.

Representative portions of fine grained Group A, B, C, or D samples were prepared using the wet method described in Section 10.1 of ASTM D4318. The liquid limit of each sample was determined using the multipoint method (Method A) described in Section 11. The liquid limit is by definition the moisture content

where 25 drops of a hand operated liquid limit device are required to close a standard width groove cut in a soil sample placed in the device. After each test, the moisture content of the sample was adjusted and the sample replaced in the device. The test was repeated to provide a minimum of three widely spaced combinations of N versus moisture content. When plotted on semilog paper, the liquid limit moisture content was determined by straight line interpolation between the data points at N equals 25 blows.

The plastic limit was determined using the procedure described in Section 17 of ASTM D4318. A selected portion of the soil used in the liquid limit test was kneaded and rolled by hand until it could no longer be rolled to a 3.2 mm thread on a glass plate. This procedure was repeated until at least 6 grams of material was accumulated, at which point the moisture content was determined using the methods described in ASTM D2216.

Percent Fines Determination of Samples

A selected specimen of soils was washed over a No. 200 sieve after being thoroughly mixed and dried. This test was conducted in general accordance with ASTM D1140, *Standard Test Method for Amount of Material Finer Than the No. 200 Sieve*. Method A, using water to wash the sample through the sieve without soaking the sample for a prescribed period of time, was used and the percentage by weight of material washing through the sieve was deemed the "percent fines" or percent clay and silt fraction.

Compaction Tests of Soils Using Standard Effort

Soil placed as engineering fill is compacted to a dense state to obtain satisfactory engineering properties. Laboratory compaction tests provide the basis for determining the percent compaction and water content needed to achieve the required engineering properties, and for controlling construction to assure the required compaction and water contents are achieved. Test procedures generally followed those described by ASTM D698, *Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 lbf/ft³)*.

The relationship between water content and the dry unit weight is determined for soils compacted in either 4 or 6 inch diameter molds with a 5.5 lbf rammer dropped from a height of 12 inches, producing a compactive effort of 12,400 lbf/ft³. ASTM D 698 provides three alternative procedures depending on material gradation:

Method A (Shall be used if 20 percent or less by weight is retained on No. 4 sieve)

- ◆ All material passes No. 4 sieve size
- ◆ 4 inch diameter mold
- ◆ Soil in 3 layers with 25 blows per layer

Soil was compacted in the mold in three layers of approximately equal thickness, each compacted with either 25 or 56 blows of the rammer. After compaction of the sample in the mold, the resulting dry density and moisture content was determined and the procedure repeated. Separate soils were used for each sample point, adjusting the moisture content of the soil as described in Section 10.2 (Moist Preparation Method). The procedure was repeated for a sufficient number of water content values to allow the dry density vs. water content values to be plotted and the maximum dry density and optimum moisture content to be determined from the resulting curvilinear relationship.

Laboratory California Bearing Ratio Tests of Compacted Samples

This method is used to evaluate the potential strength of subgrade, subbase, and base course material, including recycled materials, for use in road and airfield pavements. Laboratory CBR tests were run in general accordance with the procedures laid out in ASTM D1883, *Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils*. Specimens were prepared in standard molds using three different levels of compactive effort within plus or minus 0.5 percent of the optimum moisture content value. While embedded in the compaction mold, each sample was inundated for a minimum period of 96 hours to achieve saturation. During inundation the specimen was surcharged by a weight approximating the anticipated weight of the pavement and base course layers. After removing the sample from the soaking bath, the soil was then sheared by jacking a piston having a cross sectional area of 3 square inches into the end surface of the specimen. The piston was jacked 0.5 inches into the specimen at a constant rate of 0.05 inches per minute.

The CBR is defined as the load required to penetrate a material to a predetermined depth, compared to the load required to penetrate a standard sample of crushed stone to the same depth. The CBR value was usually based on the load ratio for a penetration of 0.10 inches, after correcting the load-deflection curves for surface irregularities or upward concavity. However, where the calculated CBR for a penetration of 0.20 inches was greater than the result obtained for a penetration of 0.01 inches, the test was repeated by reversing the specimen and shearing the opposite end surface. Where the second test indicated a greater CBR at 0.20 inches penetration, the CBR for 0.20 inches penetration was used.